

# BSP Test strategy for mFRR EAM

December 2023



# Introduction

This document is produced for the BSPs to help kick-start the testing of mFRR EAM. Its content is to be used as a framework for how BSP and TSO will work together securing quality in mFRR EAM go-live.

The document contains different types of information that we hope will be useful for you, such as:

- Plans, for example descriptions of test phases and timelines
- Processes, for example how we will communicate and report on defects.
- Practical information, for example on test environments and how to connect to them.

You will also find links to documents and assets in the appendix.

# How to get started

- Send us contact information at [bsptest@statnett.no](mailto:bsptest@statnett.no), and we will contact you directly for a talk on further collaboration.
- All questions related to test, test scenarios, functionality etc. can be directed to [bsptest@statnett.no](mailto:bsptest@statnett.no).
- Start building an understanding for what and how we must test:
  1. Take a look at chapter 3 "Road map for test" to see the timeline and content for the different test phases.
  2. Take a look at chapter 9 "Test data" for an overview of the main bid types and some key characteristics.
  3. Read the mFRR EAM implementation guide for further details on bid submission and attributes (see link in appendix A).
- Start preparation of test environment(s)
  - Start dialog internally or with system vendor/service provider to plan environment usage.
  - See chapter 8 "Test environment" for connection details.
- Start planning test
  - Which test cases/go-live-criteria must be verified before you are comfortable with go-live? (see chapter 7 "Go-live preparation and entry criteria").
  - Which attributes best describe your mFRR reserve situation?
    - The easiest way may be to start with how things work today, and how these real-life situations can be described with new attributes.
  - Consider how value chains can be tested to secure that regulation reserves handles activations via new mFRR EAM.
  - TSO is interested in collaborating on test scenarios. Creating test scenarios will be an ongoing and iterative process. Statnett is aiming to create a collection of generic test scenarios that can be used by all BSPs.
- Use this document as a framework on how we are working together and do not hesitate to suggest improvements (via [bsptest@statnett.no](mailto:bsptest@statnett.no) or directly via Teams-chat).

# Table of Contents

- [Chapter 1: Target group, objective and early test](#)
- [Chapter 2: How will we succeed?](#)
- [Chapter 3: Road map for test](#)
- [Chapter 4: Test Organization](#)
- [Chapter 5: Meeting places & Communication](#)
- [Chapter 6: Tools and reporting](#)
- [Chapter 7: Go-live preparation and entry criteria](#)
- [Chapter 8: Test environments](#)
- [Chapter 9: Test data](#)
- [Chapter 10: Operator training](#)
- [Chapter 11: Implementation bonus](#)
- [Chapter 12: Appendix](#)

# Target group, objective and early test

Who is this document for and what do we want to achieve using mutual test principles.



# Target Group

This document is written for all stakeholders with interest in the quality process of verifying the new Nordic Balancing Model (NBM) for mFRR EAM to secure go-live on December 3<sup>rd</sup>, 2024. Stakeholders are listed below in a non-exhaustive list:

- BSP Stakeholders
- BSP System vendors
- TSO Stakeholders
  - TSO - Transmission system operators (Nordic)
  - BSO - Balancing System Operators
  - BSE - Balancing system Engineers
- Test Management (Test Managers, Testers, Security Testers, Technical Testers)
- Developers, Scrum Masters, Architects, UX Designers
- Operators of relevant IT solutions incl. IT infrastructure
- Project Management
- Product and Business Owners
- Domain experts



# Objective

The objective of this document is to onboard all relevant BSPs and system vendors onto the process of early testing and verification of mFRR EAM. It is crucial that BSPs and system vendors together with TSO start testing early. All BSPs who wants to join the mFRR EAM market must complete all test phases. Both functional and non-functional requirements must be approved in the testing before go-live is possible on December 3<sup>rd</sup>, 2024.

This document will provide guidelines for planning, development, execution, error handling and test reporting. It also gives an outline for when we need to complete the different test stages.

The BSP test strategy will strictly focus on the collaboration on how to ensure a successful test and verification process before Go-Live of mFRR EAM between TSO, BSPs and system vendors.

# Test Early!

We should work closely together and encourage frequent communication on test cases, status, difficulties and improvement suggestions to the test process. The following mutual **test principles** should be adopted to help us reach our final objective of go-live mFRR EAM on December 3<sup>rd</sup> , 2024.

- Test as much as possible as early as possible.
  - Test functional and non-functional aspects as soon as possible
  - Test systems and integrations as soon as possible
  - Strive to test what is most important, most complex and most error prone as early as possible.
- Fail fast by early testing.
  - Early testing can uncover errors in understanding of requirements or in the physical implementation of software. It is important that we test code and requirements early so that we uncover defects fast and save time.
- Test cases and test results should be traceable.

The framework for how BSPs, system vendors and TSO will collaborate on test planning and execution in various test phases, should be continuously improved.



# How will we succeed?

TSO and BSPs are in this change together and we are mutually dependent on each other. This chapter proposes some thoughts on what this change will require of us.



# We are in this together

- TSO and BSPs have a **joint interest** to reach go-live for mFRR EAM. The consequence if we fail is that we will delay the European transition to 15 minutes market and settlement time resolution.
- We are **completely dependent on each other** to test and verify that our solutions work according to requirements and intent of use.
- We must **test early** to uncover challenges and have time to resolve errors identified during test collaboration.
- **TSO** wants to **facilitate** processes, environments and resources to ensure that it is easy for BSPs and system vendors to start this journey together with TSO as soon as possible.
- TSO wants **BSP** to **contribute** to early testing of value chains from bid submission to their own regulation objects, and by this activity produce test data that makes testing of value chains at TSO possible. Both value chains make up the totality of mFRR EAM and must be ready in time for go-live.

# TSO facilitates

- TSO introduces four test phases and wants all BSPs to complete all phases.
- TSO offers communication channels to resources that can help with all aspects of getting test started and help with issues during test execution.
- TSO offers two test environments for the different test phases. For the final phase, the TSO's verification test, we have not yet concluded which environment to use.
- TSO is eager to accommodate BSPs that are ready and wants to start testing. It is important that the test environments are stable during testing. If many BSPs are ready for testing at the same time, we might have to coordinate and agree on time slots for BSP testing.

# BSP contributes

- BSP offers a point of contact to coordinate and collaborate with TSO.
- BSP establishes test environment(s) to cover necessary value chain testing of own infrastructure.
- Start early evaluation of infrastructural requirements and test scenarios to cover real-life situations.
- Keep an open dialog with TSO on progress and issues.

# Remember value chain testing!

- Necessary test environments must be established and connected between BSPs and TSO.
- BSPs must evaluate how and what to test in their own value chains. Starting with submitting bids and receiving bid activation orders, and forward activations to EMS SCADA systems if BSP will automate power regulation of reserve objects.
- TSO depends on a large number of bids generated by many BSPs to verify that mFRR reserve requirements are fulfilled on a national level.
- Testing together with many other BSPs in a production-like environment gives an opportunity for each BSP to test the effect of bid attribute compositions and that bids reflect the physical limitations of the regulation objects.
- BSPs and TSO must meet in the middle, bringing together test scenarios that cover the total value chain in mFRR EAM and executing tests in collaboration.

# Roadmap for test

This chapter introduces four test phases to organize test collaboration between BSPs, system vendors and TSO.

The road map suggests a timeline with the four test phases.





# Test phases

## 1. Initial system integration test

The goal of this test phase is to verify that submitted bid messages comply with syntax and business rules. It is desirable that all BSPs and/or system vendor complete a full syntax test of bid messages including all relevant bid-attributes, before they can start BSP end-to-end testing.

Each BSP and/or system vendor should have a test environment that can generate bid messages and connect it to TSO test environment "BSP Syntax Test", which is a self-service environment.

## 2. BSP End-to-End test

The primary goal of this test phase is to complete testing on a high and realistic number of bids from as many BSPs as possible where the bid collection resembles what we can expect in production. BSPs should explore how bid attributes and compositions can describe their day-to-day operational situation and how it affects bid activation. To reach this goal each BSP will have to verify bid submission and activation, non-functional requirements, and conduct "normal day" testing on a variety of scenarios. This test phase will most likely contain several "iterations" where we test with larger and larger numbers of bids and more of the value chain as time goes on and more BSPs enter the test phase.

Each BSP must have an E2E-test environment and connect it to TSO E2E-test environment "BSP E2E Test".

Note: Actual activation of resources in production to verify complete value chains is not within scope of the test. If desired by the BSP it must happen in agreement with TSO and the National Control Centre and will be conducted on a low activation volume (MW).

## 3. Fallback test

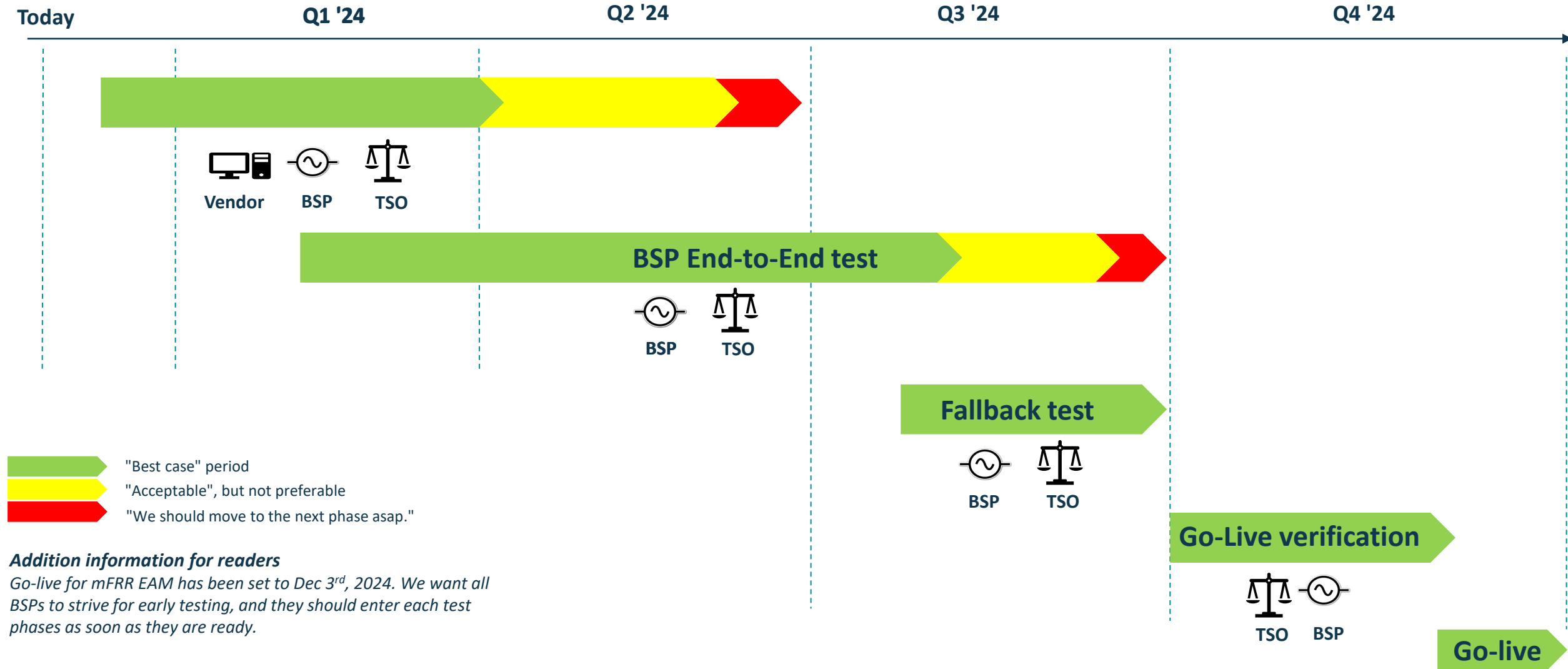
The goal of this test phase is to establish clear routines and processes for fallback situations. This phase might include both theoretical "desktop exercises" and testing of specific scenarios. All parties involved will have to contribute with knowledge and experience to make sure we cover potential real-life events.

## 4. TSO Go-live verification test with BSPs

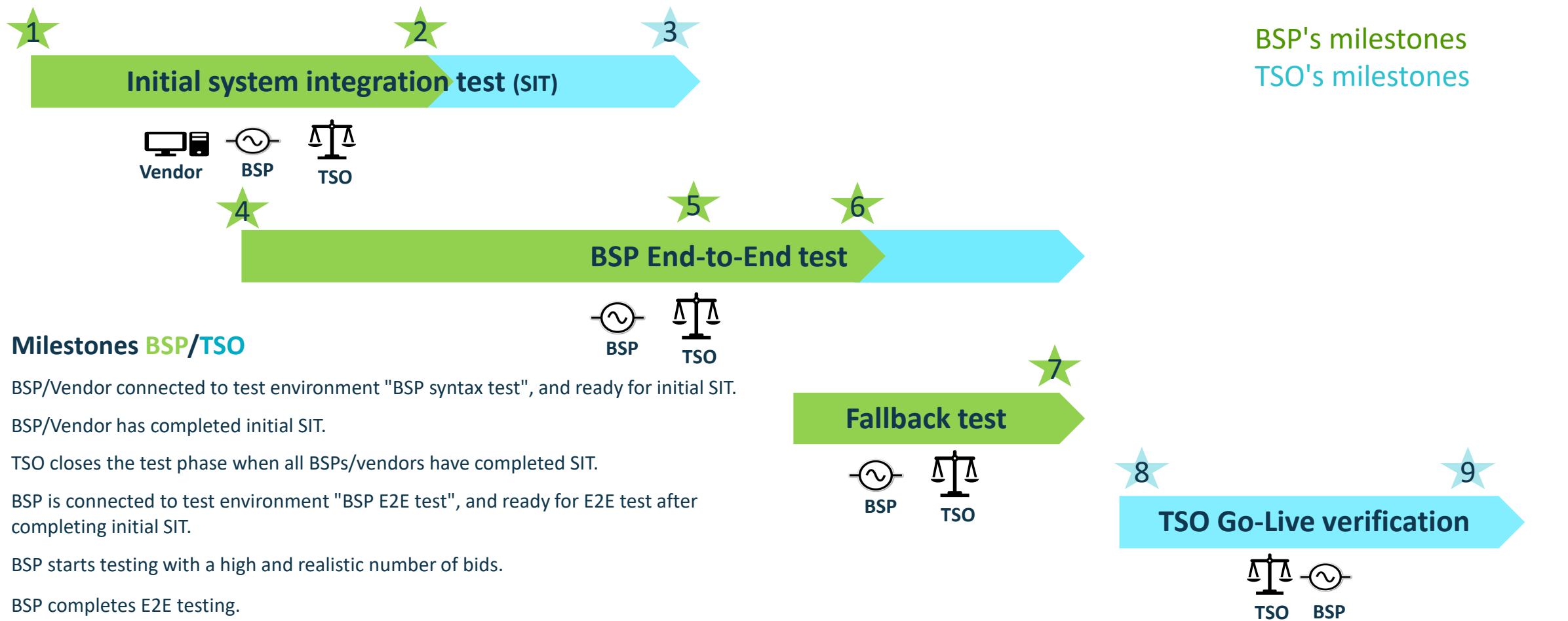
The goal of this test phase is to test the complete value chain of mFRR EAM processes, including elements outside bid handling. Defined go-live criteria must be met. This final verification test must include the vast majority of available mFRR reserves needed for secure operation. Tests executed in BSP end-to-end test might have to be repeated in this phase and might include everything from normal day to performance test. Test environment for this test phase is to be decided.



# Timeline for test phases



# Milestones for test phases



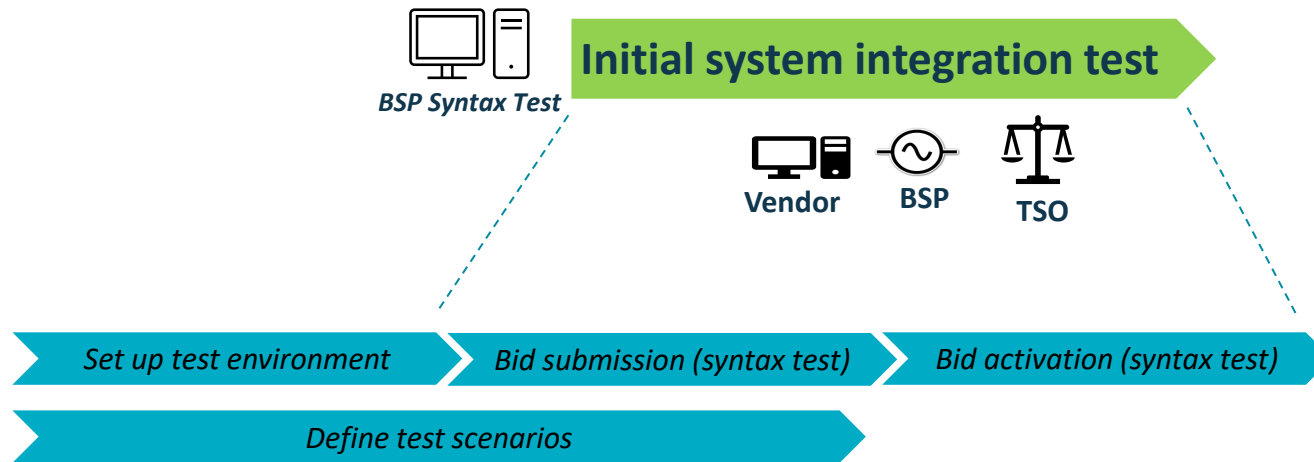
BSP's milestones  
TSO's milestones

## ★ Milestones BSP/TSO

- MS 1** BSP/Vendor connected to test environment "BSP syntax test", and ready for initial SIT.
- MS 2** BSP/Vendor has completed initial SIT.
- MS 3** TSO closes the test phase when all BSPs/vendors have completed SIT.
- MS 4** BSP is connected to test environment "BSP E2E test", and ready for E2E test after completing initial SIT.
- MS 5** BSP starts testing with a high and realistic number of bids.
- MS 6** BSP completes E2E testing.
- MS 7** BSP completes fallback test
- MS 8** TSO can start Go-Live verification test when all BSPs have completed E2E test.
- MS 9** TSO completes Go-Live verification test

# Initial system integration test (SIT)

## Detailed scope



### Entry criteria

Each BSP and/or system vendor must have a system test environment configured and connected to TSO test environment "BSP Syntax Test".

### Scope of testing

- Define test scenarios/test cases that are relevant for BSP.
- Syntax testing for functional requirements.
- Syntax testing all (relevant) bid attributes.
- Bid submission and activation processes, with all relevant messages.

### Milestones

MS 1 – Connected to test environment "BSP Syntax test" and ready for initial SIT.  
MS 2 – Completed initial SIT.

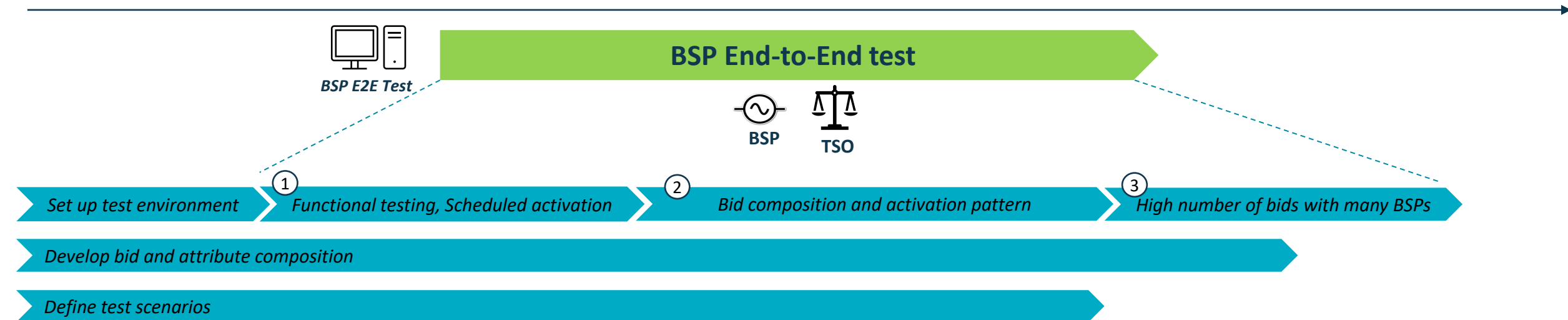
### Exit criteria

- As much as possible of the test scope should be covered before the BSP and/or system vendor starts end-to-end testing in the next phase. Moving to the next phase is done in agreement with TSO.
- All (relevant) attributes should be tested before formally ending the test phase.

# BSP End-to-End test

## Key goals

The BSP end-to-end test is the largest test phase and consists of several steps and areas that we may want to test. The total scope can be defined through different "lenses", or angles of approach. Here we present it as 3 key goals where each builds upon the previous.



### ① Functional testing, Scheduled activation

- Bid generation and submission works with TSO integration. Simple and complex bids linked in time works as specified in the mFRR implementation guide.

### ② Bid composition and activation pattern

- Investigate through testing how all available mFRR reserves/regulation objects can be described with bid-attributes.
- Investigate through testing how activation pattern works with BSP's choice of attributes. Which bids are activated and how does activations potentially change with different use of attributes.
- Investigate through testing that regulation objects can handle activation patterns uncovered in test.
- Non-functional aspects like performance should be tested.

### ③ High number of bids with many BSPs

- Testing with a high number of bids with multiple BSPs allows us to see the effects of mFRR EAM in a more production-like environment. From the TSO's point of view we need to verify that mFRR demand is fulfilled. From the BSPs perspective this can give insight into how activation patterns will look in production and therefore serve as a good production test.

# BSP End-to-End test

## Detailed scope

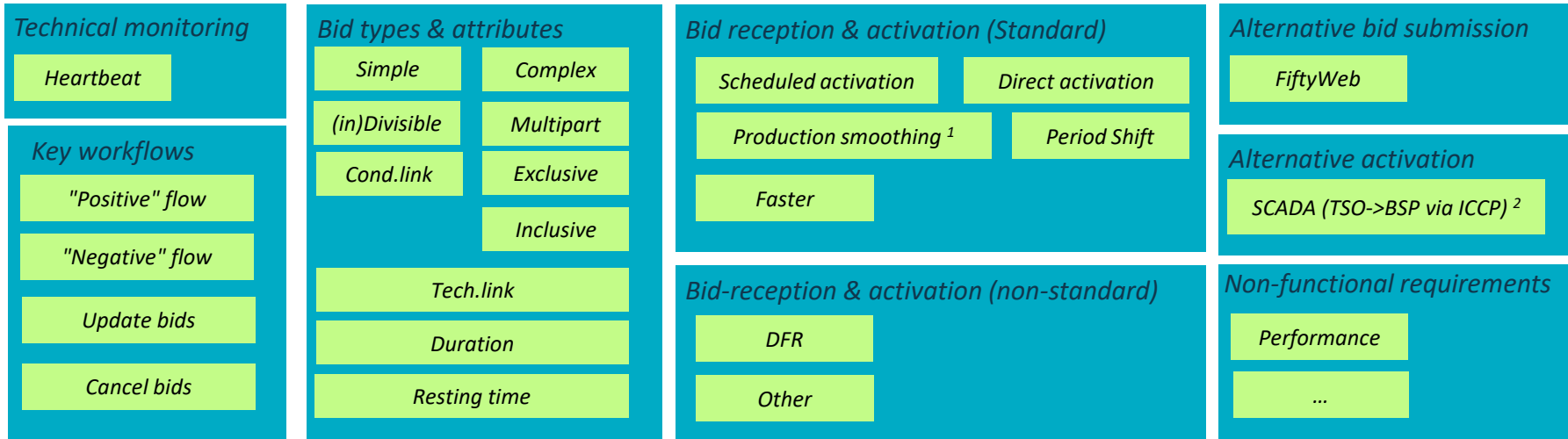
In this slide we have split up the different parts of the end-to-end test in separate areas that we should test. While it probably makes sense to test some aspects earlier than others, we don't necessarily imply that there is a specific order here (from left to right). Each BSP needs to consider what is relevant for them, depending on how they have configured their bidding. Remember the test principles given in chapter 1 "Target group, objective and early test"



### BSP End-to-End test



#### Set up test environment



#### Entry criteria

Initial SIT completed. BSP test environment configured and connected to TSO test environment "BSP E2E Test". Ready to test a bigger part of the value chain, including receiving activation orders.

#### Scope of testing

- Verify that Heartbeat monitoring works as intended.
- Verify scheduled activation and handle "normal day" imbalances.
- Verify direct activation to handle challenging imbalances.
- Verify period shift.
- Conduct testing with high number of bids, and several BSPs.
- Test non-functional requirements.

#### Milestones

- MS 4 – Connected to test environment "BSP E2E test", and ready for E2E test after completing initial SIT.
- MS 5 – Start testing with a high number of bids, together with other BSPs.
- MS 6 – Complete E2E testing.

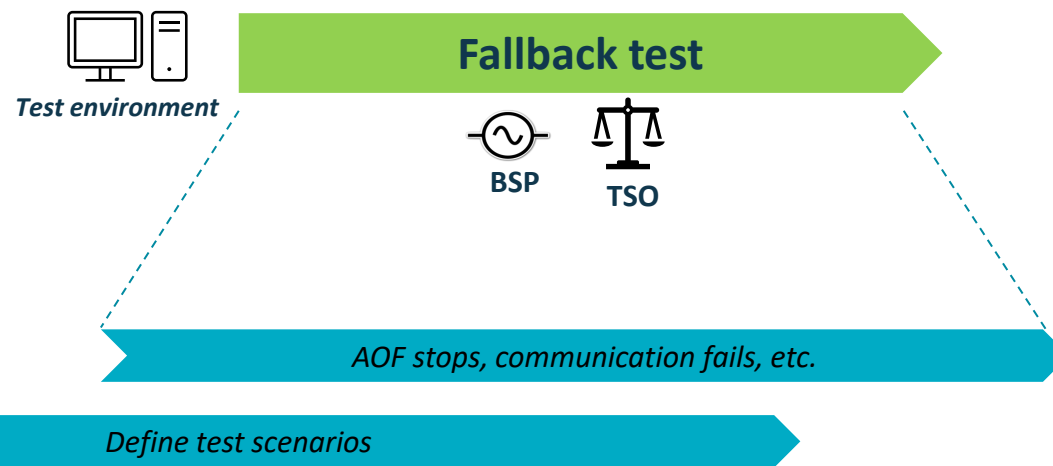
#### Exit criteria

The BSP verifies all relevant test scope.

1: relevant only for a short period after mFRR EAM go-live until go-live IDC/ISP 15 minutes  
 2: to be determined if this is relevant

# Fallback test

## Detailed scope



### Entry criteria

End-to-end testing started, and BSP considers the systems mature enough to conduct fallback testing.

### Scope of testing

- Define and agree on processes to handle relevant fallback scenarios.
- TSO is currently evaluating processes and routines, and this work may result in necessary test scenarios for fallback.
- Input from BSPs are welcome in order to define scenarios where fallback solutions are required/requested.
- Currently Known fallback situations are bid submission via FiftyWeb, loss of AOF that will trigger local bid-selection without affecting BSPs.
- Tests that require a test environment will be conducted, if needed. Otherwise, testing will be done as a "desktop exercises".

### Milestones

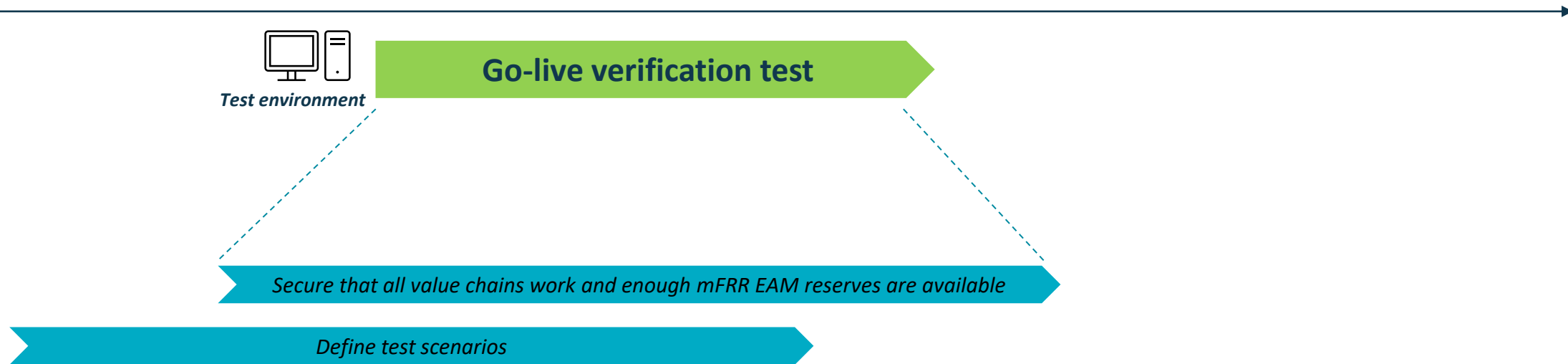
MS 7 - Complete fallback testing.

### Exit criteria

Relevant fallback scenarios are covered by processes, where it is deemed necessary.

# TSO Go-live verification test with BSPs

## Detailed scope



### Entry criteria

BSP End-to-end test and fallback test has been completed.

### Scope of testing

Content of this phase will have to mature with experiences from previous test phases. The goal of this phase is to test with many BSPs to fill the need in the mFRR requests and test all value chains through:

- Normal day testing
- Handling of events (loss of production, etc.)
- Testing a high number of bids
- Performance testing
- Bottlenecks, settlement etc.

### Milestones

MS 8 – TSO starts Go-Live verification test when all BSPs have completed E2E test.

MS 9 – TSO completes verification test.

### Exit criteria

TSO considers and decides if the solution is ready for production based on formal criteria defined at a Nordic level.



# Test organization

The purpose of this chapter is to suggest an effective test organization with clear role expectations and communication channels.



# Test organization overview

TSO wants the test organization to be mirrored across BSP and TSO. We believe this will enable more efficient collaboration, and as a result we have clear expectations and role responsibilities. It is important that BSP and TSO both have people who are responsible for testing.

Next slide illustrates roles that are expected to be involved in test planning and available during test execution.

We know all BSPs are unique and might not have a separate test organization or people to fill in new roles. We hope that we can strive to fill the different roles and at the same time be open about limitations in number of people with dedicated time. Several roles can be covered by one person.

# Test organization and roles

## BSP test organization

### Test team:

- BSP Test Lead
- BSP Tester(s)
- Domain experts

### Test execution team

- Tester(s)
- Developers
- System vendor representatives (if relevant)
- IT Operations

## TSO test organization

### Test team:

- TSO Test lead
- TSO Tester(s)
- Domain experts

### Test execution team

- Tester(s)
- Developers
- IT operations

# Test Lead Responsibilities

	Task	Description
BSP Test Lead Responsibilities	Point of contact	<i>Responsible for keeping contact with TSO and to coordinate test collaboration with TSO.</i>
	Progress reporting	<i>Communicate status and progress relevant to test coordination and collaboration with TSO.</i>
	Test planning	<i>Plan and coordinate with tester(s) and domain experts at BSP to produce test scenarios and go-live/entry criteria. TSO should also be informed and consulted in scenario planning.</i>
	Coordinate test execution with TSO	<i>Make sure test execution team is available and ready in test execution periods. Communicate and escalate issues to TSO.</i>
TSO Test Lead Responsibilities	Point of contact and facilitator	<i>Responsible for keeping contact with BSPs and to facilitate an easy start and early testing with all BSPs involved.</i>
	Test planning	<i>Coordinate collaboration on test planning with BSPs.</i>
	Issue tracking <a href="mailto:bsptest@statnett.no">bsptest@statnett.no</a>	<i>Responsible for replying to inquiries or defects received via email.</i>
	Defect management	<i>Dispatcher of defects. Follow up on defects from status analysis to closed, and continuously communicate status to relevant BSPs.</i>
	Release management	<i>Coordinate new releases in BSP E2E Environment and communicate to BSPs.</i>
	Coordinate test execution	<i>Collaborate on test plans with BSPs. Make sure TSO test execution team is available and ready in test execution periods.</i>

# Tester Responsibilities

	Task	Description
BSP Tester Responsibilities	Test planning	<i>BSP testers should participate in test planning to produce test scenarios and go-live/entry criteria that cover real life situations relevant for BSP.</i>
	Test execution	<i>BSP tester is responsible for executing planned test scenarios and value chains at BSP.</i>
	Defect reporting	<i>BSP tester is responsible for reporting potential defects to TSO via <a href="mailto:bspctest@statnett.no">bspctest@statnett.no</a> or directly via Teams-chat to TSO tester during test execution periods.</i>
	Collaborate and coordinate with test execution team and TSO	<i>During test periods tester(s) are responsible for coordinating and collaborating with domain experts, system vendor and developer to make sure solutions are fit for use.</i>
TSO Tester Responsibilities	Point of contact for BSP tester	<i>TSO tester should serve as point of contact during test periods.</i>
	Test planning	<i>TSO testers should be informed and consulted in BSP test planning and production of test scenarios that cover real life situations relevant for BSP and TSO.</i>
	Defect registration BSP → Jira	<i>TSO tester is responsible for receiving defects from BSP testers and follow up internally at TSO.</i>
	Defect Analysis	<i>TSO tester is responsible for conducting first analysis on potential defects and follow up with domain experts, developers and BSP to resolve defects.</i>
	Test execution	<i>TSO tester is responsible for assisting BSP testing and executing necessary value chain testing at TSO.</i>

# Meeting places & Communication

This chapter documents planned meeting places and how to contact TSO.



# Contact information

It is necessary to exchange point of contact between BSP and TSO. It is expected that each BSP has a BSP test lead, and that this person is point of contact for TSO test lead.

## 1. Point of contact BSP

- Contact information of BSP test lead is expected to be communicated to TSO test lead via [bsptest@statnett.no](mailto:bsptest@statnett.no) as soon as possible, and latest by end of December 2023.

## 2. Point of contact TSO

- [bsptest@statnett.no](mailto:bsptest@statnett.no)
- Any questions related to BSP test for mFRR EAM can be directed to TSO via this email.

## 3. Point of contact for defect reporting

- Defects can be reported via [bsptest@statnett.no](mailto:bsptest@statnett.no)
- Defects can be reported directly to TSO test team during BSP test periods in Teams chat.
- All reported defects should contain a set of required input information, see "[Required input in defect reporting](#)".

Note: [bsptest@statnett.no](mailto:bsptest@statnett.no) is a new contact address for test related inquiries. The existing contact address [bsp@statnett.no](mailto:bsp@statnett.no) is still valid for general BSP related inquiries. If inquiries are sent to either of these addresses, we will get back to you.



# Meeting places

Meeting type	When?	Where?	Topics/agenda
Test & technical meeting	Monthly	Teams meeting	<p><i>Fora to share information with all BSPs and for BSPs to ask and discuss both technical questions related to development and test related questions.</i></p> <p><i>Agenda:</i></p> <ul style="list-style-type: none"> <li>• TSO updates on development status, defect situation, change in implementation guide etc.</li> <li>• TSO updates on test status, plan for common test scenarios, change in processes etc.</li> <li>• BSP Q&amp;A</li> <li>• Alternatively: Guest performances based on content requests from BSPs</li> </ul> <p><i>Note: If any BSPs have content requests for this meeting, it can be communicated to TSO test lead directly, or via <a href="mailto:bsptest@statnett.no">bsptest@statnett.no</a>. If BSP wants to discuss a specific theme in depth, a heads up should be communicated to TSO.</i></p>
Bilateral meetings BSP & TSO	By appointment	Teams chat Teams meeting	<p><i>BSP bilateral meetings with TSO is relevant if</i></p> <ul style="list-style-type: none"> <li>• BSP have a need for clarifications/discussions relevant for own purposes/solutions only</li> <li>• BSP wants to discuss test plans and/or scenarios</li> <li>• BSP or TSO needs to discuss defect(s) affecting BSP</li> </ul> <p><i>This bilateral interaction will be scheduled via teams and include persons with relevant competency. Chat or meeting will vary with the situation. Requests for these type of meetings can be done via TSO test lead directly, or via <a href="mailto:bsptest@statnett.no">bsptest@statnett.no</a>.</i></p>
Open Test Channel	During testing	Teams chat Teams meeting	<p><i>TSO must be informed about BSP's test plan and progress. Test activity in TSO environments must be scheduled. In some cases, TSO and BSP might have to test together, but with time and maturity of the E2E-environment it might be enough that TSO is informed about activity. In any case an "open" Teams channel is to be used for ongoing updates and collaboration.</i></p>

# Tools and reporting

This chapter describes which tools are in use, how to report defects and how TSO will handle deploy routines.



# Tools and reporting

- Primary communication channel between BSPs and TSO is Teams-chat or Teams-meeting.
- Formal requests and defect registration can be sent through [bsptest@statnett.no](mailto:bsptest@statnett.no). If direct Teams-chat does not deliver on response-time, formal channels should always be used. However, TSO aims for high-speed communication via Teams.
- TSO does not demand any specific tools to be used during testing or in reporting. Each BSP decides this depending on their own needs.
- TSO will use Jira for issue and status tracking.
- BSPs will not have access to Jira but will be informed on their own issues, and when needed.
- Common status and defect information which is not time critical, will be communicated in "Test & technical meetings" and online at the [BSP integration website](#).
- TSO keeps track of the overall status and progress for all BSPs for coordination purposes. We will not require regular status reports from BSPs but appreciate an open and informal dialogue and continuous updates on how testing is progressing. This information will not be shared between BSPs or outside mFRR EAM project.

# Defect reporting

- In general, we want defects to be reported via [bsptest@statnett.no](mailto:bsptest@statnett.no) or through direct Teams-chat during testing.
- To make first analysis effective please include as much and precise information as possible. Have a look at "[useful input in defect reporting](#)".
- TSO registers the defect, performs a first analysis and accepts the defect if:
  1. Analysis shows that the defect must be fixed by Statnett.
  2. The defect needs detailed analysis before conclusion.
- TSO returns a fix as soon as possible according to priority and severity. Affected BSPs are notified directly.
- TSO returns the defect if the analysis implies that:
  1. The defect is a misconception of the solution.
  2. The defect must be fixed by the BSP/system vendor.
- In all cases all parties should keep a good dialog and challenge the solution if something appears to be incorrect. Any required changes will be analyzed and prioritized by TSO.

# Defect reporting process

*This slide illustrates the defect workflow when TSO must fix the defect and when BSP must fix the defect*



BSP



TSO

1 Report defect at [bsptest@statnett.no](mailto:bsptest@statnett.no) or via Teams



2 Register defect in Jira  
3 Do first analysis



4 Defect to be fixed or analyzed is assigned to development team

5 Continuous status report to BSP

7 BSP retest

6 Fixed, tested and deployed

1 Report defect at [bsptest@statnett.no](mailto:bsptest@statnett.no) or via Teams



2 Register defect in Jira  
3 Do first analysis  
4 Defect to be fixed by BSP



5 BSP fixes and gives TSO status

# Useful input in defect reporting

- Email Subject: "*Defect* - <*short description of defect*>" (if reporting via [bsptest@statnett.no](mailto:bsptest@statnett.no))
- Reporter/contact person.
  - Contact information in case further clarification is necessary.
- Impact on the system
  - Priority/Severity (see definition next slide and classify from BSP point of view)
- Detailed context and description to reproduce the defect
  - Date/time/environment
  - Which action resulted in the defect
    - Describe the test case leading up to the defect
  - Is it reproducible?
  - Describe expected result vs. actual result
  - Supply enough context
- Provide attachments
  - Include XML files to reproduce if applicable.
  - Screenshots if relevant
  - Logs if available

# Defect Priority & Severity

## Severity | "What can go to production or not?"

A - Critical	<i>Errors that lead to a stop in the use of the solution in an important functional area or for a critical group of users, and which cannot be dealt with in a reasonable way.</i>
B - Serious	<i>Errors that delay the use of the solution, but that can be circumvented in a reasonable way in a short period of time. All stops in the use of the solution are classified as B-errors, if this does not fall under the definition of A-error.</i>
C - Minor	<i>Errors that do not qualify as A or B errors.</i>

## Priority | "What do we need to fix first?"

A - High	<i>Errors that prevent further testing or development progress of affected functional area. The defect must be corrected, retested and approved before the affected test objects can be approved.</i>
B - Medium	<i>Errors that slows down test or development progress of affected functional area and is of such nature that it must be corrected, retested and approved before the affected test objects can be approved.</i>
C - Low	<i>The error should be corrected, retested and approved, but this is not critical for the approval of affected test objects.</i>



# Deploy process & release management

## TSO

- Important defect fixes will be deployed as soon as possible to test environments
- New functionality will silently be released every three weeks and should not affect BSPs.
- BSPs will be notified directly about relevant defect fixes via Teams.
- BSPs will in general be notified about defect fixes and other functionality via test channels like "Test/Technical meeting" or via [BSP integration website](#).

## BSP

- TSO would during testing like to have a good dialog on environment status like:
  - Inform TSO about any deploy routines in connected test environments
  - Update TSO on status of important and relevant defect fixes that affect testing in BSP E2E test environment.

# Go-live preparation and entry criteria

How can we prepare and evaluate readiness for go-live?



# How to prepare for go-live?

- Which entry criteria must be met to make us comfortable to go-live with mFRR EAM.
- All BSPs are advised to have their own go-live-readiness evaluations and entry criteria for the new market mFRR EAM.
- These criteria can help us communicate status and continuously work towards our common goal; go-live of mFRR EAM.
- TSO and BSP should keep an open dialog and collaborate on reaching entry criteria for go-live.
- Some criteria may be obvious, but others require more time to mature. The best way to mature is to start practicing in our mFRR EAM test environment as early as possible.
- See [Appendix B](#) for suggestions.

# TSO preparation

- Statnett has defined entry criteria for go-live of mFRR EAM on Nordic level and locally.
- One important criterion which depend on collaboration and help from BSPs is: ***Statnett must ensure that the new mFRR EAM market meets reserve requirements.***
- Reserve requirements are difficult to quantify exactly, but Statnett wish for all BSPs currently active in the market to be ready for the new market with at least the same quantity of reserves as today.
- A successful BSP end-to-end test will give confidence that we can fulfill reserve requirements, and therefore we are dependent on participation from a significant number of BSPs.
- Another initiative to help secure operations and reserve situation by go-live mFRR EAM is ***Shadow operation.*** In shadow operation bids from production (as is today) are translated into new format which gives grounds to compare the performance of production and the new mFRR EAM with regards to several metrics.
- With time the BSP E2E test environment will become the most production-like test environment, receiving "real" bid-attribute-compositions from BSPs. This can provide an even more realistic shadow operation.

# Go-live operational planning

- All parties are advised to start preparing for how we will go live
  - Define how to update production with mFRR EAM.
  - Decide who must be involved.
  - Identify dependencies and requirements to external parties (e.g. TSO) and communicate this to all relevant parties.
  - Create detailed list of actions on go-live day.
  - Create rollback plan
    - Plan criteria for rollback and a corresponding rollback plan to be used if this is deemed necessary shortly after go-live.
- Go-live and rollback planning will require collaboration between BSP and TSO.
- Early planning on each side will help to speed up collaboration and mitigate risks of late surprises.

# Test environments

This chapter lists test environments that are available for BSPs, their purpose and use, how to connect to them, and more.



# Environments and purpose

Environment	Test phase	What can we test/verify	Rules for use	Status
BSP Syntax Test	Initial System integration test	<p>This test environment is used to verify simple bid-flows and technical syntax of bids.</p> <p><b>BSPs can validate:</b></p> <p>1) <i>Submission of bids:</i></p> <ul style="list-style-type: none"> <li>• Submission of bids (message type ReserveBid_MarketDocument).</li> <li>• Reception of receipt/ack of submitted bid (message type Acknowledgement_MarketDocument).</li> </ul> <p>2) <i>Activation:</i></p> <ul style="list-style-type: none"> <li>• Reception activation orders (message type Activation_MarketDocument) for different types of activations.</li> <li>• Submission of receipt on the activation order (message type Acknowledgement_MarketDocument)</li> <li>• Submission of activation response (message type Activation_MarketDocument)</li> <li>• Reception of receipt on activation response (message type Acknowledgement_MarketDocument).</li> </ul> <p>3) <i>Simple flows:</i></p> <ul style="list-style-type: none"> <li>• Positive acknowledgement</li> <li>• Negative acknowledgement</li> </ul>	<ul style="list-style-type: none"> <li>• 24/7 environment – BSPs can test whenever they want.</li> </ul>	Operational



# Environments and purpose

Environment	Test phase	What can we test/verify	Rules for use	Status
BSP E2E Test	BSP End-to-end test	<p>This environment is set up to be as production-like as possible during the test phase. The environment will handle scheduled activation (SA) and in time it can also be used for more manual training on Direct Activation (DA) and non-standard products.</p> <p>BSPs should start by testing how their own bid-composition works functionally in SA, and with maturity start investigating how bid-composition and use of attributes affect which bids are selected for activation (activation pattern). Finally, when several BSPs have started testing and reached maturity, we can test simultaneously and get a more realistic picture of whether we will be able to fulfil the mFRR reserve requirements. See slide "<a href="#">BSP End-to-End test Key goals</a>".</p> <p>In addition, we should aim at testing any non-functional requirements, e.g. number of simultaneous bids and special case scenarios as early as possible. Fallback is defined as a separate test phase since it probably requires maturity, but scenarios on fallback can be tested whenever involved parties are ready.</p> <p><b>BSPs can validate:</b></p> <ul style="list-style-type: none"> <li>• Bid composition: how to use attributes to describe restrictions for relevant mFRR reserves.</li> <li>• Activation pattern: which bids are activated in a larger group of bids with different attribute composition.</li> <li>• Activation ability: activations according to activation orders from TSO.</li> <li>• High number of bids: final maturity level reached for enough BSPs to simulate and train in a more production-like environment where we have enough bids to fulfill the mFRR demand.</li> <li>• Updating and cancelling bids: How these different approaches affect among other things, performance.</li> </ul>	<ul style="list-style-type: none"> <li>• Planned test sessions between BSPs and Statnett.</li> <li>• Only Norwegian bidding zones are available (AOF is for Norway only)</li> <li>• Depending on test maturity BSP might use the environment as self-service if we see that it is possible.</li> </ul>	Planned operational in early January

# Entry criteria for test phases/environments

## Initial system integration test

- BSP test environment configured and connected to TSO test environment "BSP Syntax test"
- Ready to submit bids and receive positive and negative acknowledgement.
- Nice to have; ready to receive activation orders and send activation response

## BSP End-to-End test

- Initial system integration test completed for all or most relevant bid types/attributes.
- BSP test environment configured and connected to TSO test environment "BSP E2E Test".
- Ready to test broader value chains.

## TSO Go-live verification test with BSPs

- BSP end-to-end test and Fallback test are completed
- TSO is ready to execute full-scale testing
  - Realistic test data and sufficient mFRR reserves available through submitted bids.
  - Other TSOs ready to join testing.

# How to connect to test environments

To start using environments "BSP Syntax Test" and "BSP E2E test" please perform these following steps:

1. Make sure you have an ECP/EDX-endpoint connected (see next slide "[ECP setup](#)").
2. Configure message flow from EDX to your business applications (se slide "[EDX Routing](#)").
3. Start sending/receiving messages with ECP MessageType<sup>1</sup>.

*1. ECP MessageType is the same as EDX Business type. Valid ECP MessageTypes can be found at [BSP integration website](#)*

# ECP setup

- BSPs already participating in the balancing market probably have an ECP/EDX endpoint installed and connected to NEM-TEST.
- If in doubt you can check your settings page on ECP GUI<sup>1</sup>.
- If ECP/EDX endpoint is not installed, see latest installation guide for Nordics [here](#).
- It is possible to have multiple ECP/EDX endpoints installed and connected to NEM-TEST, but it is not necessary for BSP testing purposes.
- For Statnett to be able to route traffic to BSPs endpoint/environments we need to know two things:
  - ECP-CODE: which can be found in for example ECP-GUI Dashboard.
  - GLN-number: Identifier of your organization, used by Statnett's Business System.

1: see [Appendix C](#) for more details on ECP GUI.

# EDX Routing

- EDX can support multiple test environments at the same time
- This is achieved by using routing like follows:
  - Sending message to Statnett:
    - Send to <EDX Service name of environment>.
      - Service for *BSP Syntax test*: SERVICE-NO-MFRREAM-BSPTTEST
      - Service for *BSP E2E test*: SERVICE-NO-MFRREAM-BSPE2E
  - Receiving message from Statnett:
    - Specify routes in `edx.yml`<sup>1</sup>, one for each service to route incoming traffic to different queues depending on environment.

1: see [Appendix C](#) for details on content in `edx.yml`.

# How to connect to FiftyWeb

FiftyWeb is undergoing some development changes which means that connection information is not ready yet. We will inform you as soon as ready. Requirements for use that we currently know:

1. IP address clearing from IT department in Statnett is necessary.
2. AD group must be updated with users.
3. Link to BSP E2E instance of FiftyWeb will be provided by TSO.

# Need help?

- Questions about ECP/EDX can be sent to [ecp@statnett.no](mailto:ecp@statnett.no).
- Questions about testing in the environment can be sent to [bsptest@statnett.no](mailto:bsptest@statnett.no).
- Questions in general can be sent to [bsp@statnett.no](mailto:bsp@statnett.no).





# Test data

Bids are one very important part of test data required to secure quality assurance of mFRR EAM.



# Bids from BSPs

- Bids are the most valuable test data in integration between BSP and TSO and play a huge role in the success of mFRR EAM
  - Bids are necessary to fulfill reserve requirements and secure flexibility in the power grid.
  - Bids must describe the available reserves at BSPs to open for maximum utilization of resources and socioeconomic benefits.
- For TSO to really test the mFRR solution we need bids that are defined/configured like in production and submitted in the same volume as expected in production.
- Without a realistic bid composition value chains cannot be properly tested, and readiness is hard to predict.
- The importance of bids impose a great responsibility on BSPs and constitutes a dependency both TSO and BSP must own and handle together.

# Bid types

*The following overview illustrates the different bid types that are available. Note that some aspects have been simplified in an attempt to highlight key characteristics*

*For a detailed, more precise overview, see the mFRR EAM implementation guide.*

## Simple bid

- Fully divisible
- Partly Divisible
- Indivisible

## Complex bid

- Multipart** - A group of simple bids within the same MTU where price decides which bids are activated first. Up direction selects the cheapest bids first, down direction selects the most expensive bids first.
- Exclusive** - A group of simple bids within same MTU. Selecting one bid excludes all other bids in the group from activation.
- Inclusive** - A group of bids within same MTU. All or none of the bids in the group will be activated.

## Linked bid

- Technically linked** - Can be used for simple and complex bids and linked across as many MTUs as desirable. Prevents activation of bid if the linked bid is directly activated in the previous MTU.
  - Resting Duration
  - Maximum Duration
- Conditionally linked** - Valid only for simple bids. Link type that describes a bid's availability depending on activation status of linked bids in the two previous MTUs .
  - Conditionally available
  - Conditionally unavailable

## Activation attributes

- Scheduled Activation
- Scheduled and Direct Activation
- Period Shift** - Period Shift is set in addition to either Scheduled Activation or Scheduled/Direct Activation.
  - Period Shift Start
  - Period Shift End
  - Period Shift Both

# Message flow for bids and activations

- When submitting bids:
  - BSP submits ReserveBid\_MarketDocument (bid message)
  - BSP receives Acknowledgement\_MarketDocument (acknowledgement for bid message)
    - An acknowledgement message is sent as soon as the bid message has been processed.
  - What can go wrong:
    - If the bid message does not validate or breaks a rule, an acknowledgement message with reasons for the rejection will be sent in return.
    - If the BSP has not received an acknowledgement messages within [X] minutes:
      - the submitted bid document may have been dropped (no acknowledgement is sent)
      - the acknowledgement message may have been lost.
      - Contact support.
- When receiving activation orders:
  - BSP receives Activation\_MarketDocument (activation order request).
  - BSP submits Acknowledgement\_MarketDocument (acknowledgement for activation order request)
  - BSP submits Activation\_MarketDocument (activation order response)
  - BSP receives Acknowledgement\_MarketDocument (acknowledgement for activation order response)
  - What can go wrong:
    - If the activation response message does not validate, an acknowledgement message with reasons for the rejection will be sent in return.
- When receiving heartbeat:
  - BSP receives empty Activation\_MarketDocument (heartbeat request).
  - BSP submits Acknowledgement\_MarketDocument (acknowledgement for heartbeat request)
  - BSP submits Activation\_MarketDocument (heartbeat response)
  - BSP receives Acknowledgement\_MarketDocument (acknowledgement for heartbeat response)
- See the mFRR EAM implementation guide, specifically the mFRR energy activation market sequence diagram. (Chapter 3.2 in v1.1.3).



# Operator Training

Operator training is a separate activity and is not included in the four test phases. That doesn't mean that operator training cannot be executed during these test phases. Operator test/training must be prepared and executed in good time before Go-Live mFRR EAM.

# Operator training

- Important to start planning for Operator training early.
- BSP and TSO are responsible to cover their own needs for Operator training.
- Identify relevant training situations and requirements.
  - What training-need lies with BSP?
  - What training-need lies with TSO?
  - What do we need to conduct training on together?
- Identify what type of training is necessary.
  - Agreement on routine descriptions and guidelines?
  - Actual training on scenarios in test environments?
- Some Operator training might require a mature environment and timeslots for testing must be evaluated continuously in collaboration between BSP and TSO
- Ongoing projects/initiatives at TSO that might result in joint Operator training:
  - Process and routine requirements and descriptions are under evaluation.
  - Project business continuity is working on how to handle a situation where main systems fail, and complete manual balancing is required.



# Implementation bonus

Incentive for BSPs to reach milestones





# BSPs get an implementation bonus for reaching milestones

- The bonus shall motivate BSPs to reach milestones and cover implementation costs related to mFRR EAM.
- All four test phases introduced in the "BSP Test Strategy" will be important activities on the way to reaching Go-live incentive.
- Each BSP can get up to NOK 1 mill. if they reach all milestones
  1. Transition: go live with new format by 28.04.23 – NOK 250 000.
    - (Completed – 20 BSPs qualified)
  2. Go-live: pass tests and go live with correct functionality by December 2024 – NOK 500 000
  3. Take part in mFRR EAM the first month – NOK 250 000
- Payment will take place after the last milestone

# Appendix

1. Appendix A | Links to relevant documents and assets
2. Appendix B | Entry Criteria suggestions
3. Appendix C | Test environment



# Appendix A | Links to relevant documents and assets

List of useful documentation for BSP testing in mFRR EAM:

Implementation guide mFRR EAM:

- [Nordic balancing model - Implementation guides](#)

mFRR EAM BSP integration info and examples:

- [BSP integration website](#)

Stay updated on applicable terms and conditions for participation in mFRR EAM:

- Applicable terms and conditions: [Regulerkraftmarkedet | Statnett](#)
- Consultations: [Høringer og konsultasjoner | Statnett](#)

# Appendix B | Suggestions for mFRR EAM entry criteria

Following list can be used as inspiration to entry criteria:

- Training of Operators completed according to requirements/plan.
- Training of IT operation completed according to requirements/plan.
- All operational routines defined and implemented.
- Fallback situations defined, tested and approved.
- All necessary functionality implemented, tested and defect situation within tolerated limits.
- Deployment and go-live plan approved and ready for go-live mFRR EAM

# Appendix C | Test environment

- Settings page on ECP GUI
- edx.yml content

# Settings page on ECP GUI

- BSPs who already participates in the balancing market should have an ECP/EDX-endpoint installed and connected to NEM-TEST.
- If in doubt, check your settings page on ECP GUI
  - Typically, [https://...:8443/ECP\\_MODULE](https://...:8443/ECP_MODULE)
- Find your settings and verify network as illustrated in the picture:

## Component Directory

Code

50V000000000111W

URL and Network

[https://ecp4.statnett.no/ECP\\_MODULE](https://ecp4.statnett.no/ECP_MODULE)

DefaultNetwork

Push Configuration

Check Connectivity

# edx.yml content

Below is a valid edx.yml example of routing incoming/received traffic to two different queues depending on environment.

```
integrationChannels:
  amqpEndpoints:
    - {direction: in, code: from-amqp, queueName: edx.endpoint.outbox, replyQueueName: edx.endpoint.reply}
    - {direction: out, code: to-bsptest, queueName: edx.endpoint.inbox.bsptest, redeliveryAttempts: 1}
    - {direction: out, code: to-bspe2e, queueName: edx.endpoint.inbox.bspe2e, redeliveryAttempts: 1}
  fssfEndpoints: []
  ftpEndpoints: []
  kafkaEndpoints: []
  components:
    validations: []
    transformations: []
    externalProcessing: []
  routing:
    routes:
      - {code: route-BSPTTEST, start: toolbox-gateway, end: [to-bsptest], service: {serviceCode: NO-MFREEM-BSPTTEST, domainCode: DEFAULT_DOMAIN, serviceCatalogueCode: 50V000000000113S } }
      - {code: route-BSPE2E, start: toolbox-gateway, end: [to-bspe2e], service: {serviceCode: NO-MFREEM-BSPE2E, domainCode: DEFAULT_DOMAIN, serviceCatalogueCode: 50V000000000113S } }
    sendProcessDefaultRoute: {start: "*", end: toolbox-gateway, fail: ecp-endpoint, steps: [] }
    receiveProcessDefaultRoute: {start: toolbox-gateway, end: ecp-endpoint, fail: ecp-endpoint, steps: [] }
```