European Network of
Transmission System Operators
for Electricity

COMPLIANCE AUDIT REPORT ENERGINET.DK

22. – 23.9.2011

COMPLIANCE AUDIT CONDUCTED IN FREDERICIA BY THE ENTSO-E RG CE SG COMPLIANCE MONITORING & ENFORCEMENT
AT THE CONTROL CENTRE OF THE ENTSO-E MEMBER ENERGINET.DK

DISCLAIMER

The present Compliance Audit Report is based on the information as provided by the audited company. This report is in no way a guarantee that security and reliability on the system of the audited company and/or on the whole synchronously interconnected system of the Regional Group Continental Europe (RGCE) is ensured. This report cannot be considered as a certification of whatever form. Finally, this report does not as such have any impact on the compliance, by the audited company and/or by any other member of ENTSO-E, with the RGCE Operation Handbook and/or any other relevant applicable standard.

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1 EXECUTIVE SUMMARY

1.1 COMPLIANCE MONITORING IN ENTSO-E RGCE

The mission of the ENTSO-E System Operation Committee Regional Group Continental Europe (RGCE) is to improve the reliability and security of the interconnected power system in the Continental Europe through developing and enforcing RGCE Operation Handbook (OH) standards, monitoring the interconnected power system and assessing its future adequacy. The RGCE member TSOs are subject to compliance with all approved OH standards. The Compliance Monitoring Program (CMP) is the RGCE program that monitors and assesses compliance with these standards via:

- the annual process of self-assessment, which is applied to all TSOs, as well as
- the annual process of mandatory on-site compliance audits, which is applied to a certain number of TSOs chosen on a rotating base either directly (in case of doubts that a certain TSO complies with OH Standards) or by random.

SG Compliance Monitoring & Enforcement (CME) is in charge of performing above mentioned two processes. The 2011 is the second year of conducting mandatory compliance audits. In 2008 and 2009 CME performed four voluntary compliance audits and in 2010 six mandatory audits.

1.2 AUDITED TSO

The RGCE member TSO Energinet.dk was chosen for a Compliance Audit in 2011. CME conducted the audit on the 22nd and 23rd September 2011 at the control centre of Energinet.dk in Fredericia, Denmark.

1.3 AUDITED OH STANDARDS

The Compliance Audit encompassed 21 standards of Operation Handbook Policies 1-3 which are related to Load-Frequency Control and Performance, Scheduling and Accounting, and Operational Security. In 2010 Energinet.dk made compliance declarations in the self-assessment process for standards which will be checked against their evidence during the audit:

1 P1-A-S1.1 PRIMARY CONTROL Organisation
2 P1-B-S4 SECONDARY CONTROL RESERVE
3 P2-A-S4 General Agreements between UCTE System Operators who are affected by cross border scheduling
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5 P2-A-S5.1 Identification Code used-either EIC or GS1 (former EAN)
6 P2-A-S5.2 Agreement on the contents and granularity of the exchanged CAS (e.g. MTFS, resolution) in order to allow a sufficient matching
7 P2-A-S5.3 Agreed timing for processes (e.g. exchange of programs, matching, day ahead and intraday process, Gate Closure, Cut-Off Time)
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16 P3-A3-S4.1 Tie-lines operating conditions
17 P3-A4-S3 Principle of "No cascading with impact outside my border"
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19 P3-B-S1.2.2 Other REACTIVE POWER generation/absorption resources
20 P3-B-S2.1.2 Coordination for voltage and reactive power management
21 P3-D-S2 Transient angle Stability calculation

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1.4 RESULTS

The Audit Team found that the evidence presented by Energinet.dk during the audit were adequate. The audit team performed 2 visits to the control room (concerning Policies 1and 3 on the first day and Policy 2 on the second one) aimed at investigating evidences related to the audited standards.

The on site compliance assessment detected 2 NC level (P3-A1-S2 and P3-A3-S2) and 1 SC level (P3-A2-S1), being the remaining 18 standards FC.

With regards to the compliance level declared in the audit questionnaire 2011, the Audit Team proposes to upgrade 1 standards from SC to FC level (P3-A2-S2), to confirm SC level of 1 standard (P3-A2-S1) and to downgrade 2 standards (P3-A1-S2 from SC to NC and P3-A3-S2 from FC to NC level).

The table 1 describes Energinet.dk's compliance declaration in self assessment questionnaire 2010 and compliance audit questionnaire 2011 with compliance level suggestion by CME audit team after reviewing the evidence for the audited standards. Upgrades are highlighted with green and downgrades with red colour. Standards which kept their declaration level are not highlighted.

TABLE 1: COMPLIANCE LEVEL CHANGES FOR THE AUDITED OH STANDARDS

OH Standard	Self assessment questionnaire 2010	Compliance audit questionnaire 2011	On site compliance audit 2011
P1-A-S1.1	FC	FC	FC
P1-B-S4	FC	FC	FC
P2-A-S4	-	FC	FC
P2-A-S5	-	FC	FC
P2-A-S5.1	FC	FC	FC
P2-A-S5.2	FC	FC	FC
P2-A-S5.3	FC	FC	FC
P2-A-S5.4	FC	FC	FC
P2-A-S5.5	FC	FC	FC
P3-A1-S2	SC	SC	NC
P3-A2-S1	SC	SC	SC
P3-A2-S2	SC	SC	FC
P3-A2-S5.2	FC	FC	FC
P3-A2-S6	N/A	FC	FC
P3-A3-S2	FC	FC	NC
P3-A3-S4.1	FC	FC	FC
P3-A4-S3	FC	FC	FC
P3-A4-S4.1	FC	FC	FC
P3-B-S1.2.2	FC	FC	FC
P3-B-S2.1.2	FC	FC	FC
P3-D-S2	FC	FC	FC

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2 AUDIT REPRESENTATIVES

The Audit Team has the task to prepare and perform the Compliance Audit as well as to develop the corresponding audit report. The audit team composition is given on table 2. The TSO subject to a compliance audit may object any member of the Audit Team on the basis of a conflict of interests or the existence of other circumstances that could interfere with the impartial performance of his or her duties. The audited TSO is obligated to express its concerns with the proposed team member four weeks prior to the team's arrival on-site. The Energinet.dk didn't make any such objection. The Energinet.dk staff present during the compliance audit is given on table 3.

TABLE 2. CME AUDIT TEAM FOR ENERGINET.DK

Audit team role	Company or association	Name
Audit team leader	Terna	Silvia Moroni
Audit team member	ELES	Gorazd Sitar
Audit team member	HEP-OPS	Luka Spoljar
Audit team member	EMS	Vladimir Ilic
Audit team member	MEPSO	Antonio Ivanovski
Compliance Monitoring Advisor	ENTSO-E Secretariat	Alexander Mondovic

TABLE 3. ENERGINET.DK AUDIT STAFF

Function in the company	Title	Name
Control Area Manager		Henny Kræmer Nielsen
Head of System Operation and Control Centre, Electricity		Jens Möller Birkebaek
Head of Section, Control Centre Electricity		Bent Myllerup Jensen
Responsible Policy 1		Erik Örum
Responsible Policy 2		Gitte Agersbaek
Responsible Policy 3		Sofie Leweson
Senior Grid Planner, for Policy 3		Torsten Lund
Power System engineer on duty in the control room		Thomas Krogh

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3 AUDIT PLAN

3.1 GENERAL PROCEDURES

The purpose of this chapter is to help and provide guidance to your organization regarding the oncoming Compliance Audit. The audit will cover a chosen set of Operation Handbook (OH) standards equivalent to those monitored within the Compliance Monitoring Program 2010 self-assessment process.

Please submit the completed Audit Worksheet by email to the ENTSO-E Secretariat and send carbon copies to all Audit Team members three weeks before the first audit day. On table 4. you may find the complete schedule of the audit process for your company.

All documentation (evidence) required for the onsite audit of each standard must be available as a hard copy or in electronic format at the audit location. The Control Area Manager and/or other responsible expert personnel must be available during the audit to provide guidance to the Audit Team on where to look in the documentation for compliance to the OH standard and, if requested, to give further explanation on criteria and procedures implemented.

In preparation for the audit, please organise your supporting compliance documentation which is the evidence for your compliance for audited standards. If possible, please try to provide English versions of the documents. Otherwise please translate the main title, index and the last update of the document for the Audit Team. Previously mentioned preparations must be completed prior to the start of the on-site audit. The ENTSO-E RGCE SG CME would like to emphasize the importance of preparation for the audit. All documentation will be considered as confidential audit records and treated as such. The Audit Team will prepare a public report of its audit findings.

TABLE 4. SCHEDULE FOR THE COMPLIANCE AUDIT

Submittal of the audit material on behalf of the Audit Team	**7 weeks prior to audit**
Submittal of the completed Audit Worksheet to the Secretariat by AUDITEDTSO	**3 weeks prior to audit**
Initial draft of the audit report based on the Audit Worksheet sent to AUDITEDTSO by the Audit Team	**2 working days prior to audit**
Opening meeting of the Audit Team and CAM of AUDITED TSO (1) Introduction of the Audit Team members, (2) Description of how the on-site audit will be conducted, (3) Discussion on how confidential information will be handled, (4) Discussion on data access required by the Audit Team, (5) Announcement that the AUDITED TSO will be asked to provide feedback on the audit process and results, (6) Presentation of the TSO and TSO's organization (7) Visit at the control room	**First audit day,** 22.09.2011 09:00 – 10:30
Start of the OH standards' review: Policy 1 and 3	**First audit day,** 22.09.2011 10:45-17:30
Continue of the OH standards' review: Policy 2	**Second audit day,** 23.09.2011 08:30-10:30
Internal Audit Team meeting	**Second audit**

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	day, 23.09.2011 10:30-11:30
Closing meeting with CAM of AUDITEDTSO (1) Presentation of preliminary audit findings and recommendations to be included on the draft audit report, with a strong emphasis on the evidences for each compliance level or non compliance identified by the Audit Team, (2) Discussion and feedback by the AUDITED TSO with a possibility to object the findings, (3) In case of any non-compliance or lack of evidence of compliance, first draft proposal of the TSO on an adequate mitigation plan, including deadline. Should such an immediate proposal not be possible, the TSO must submit it afterwards in written copy within seven days.	**Second audit day,** 23.09.2011 11:30-12:30
Delivery of the draft audit report to AUDITED TSO for review	**2 weeks after the audit**
Remarks by AUDITED TSO	**4 weeks after the audit**
Delivery of the final audit report to AUDITED TSO	**6 weeks after the audit**
Acknowledgement of the final Audit Report by ENTSO-E RGCE Plenary and decision on its possible internal or external publishing.	**RGCE Plenary in 2012**

3.2 OBJECTIVES

In 2011 the objective of Compliance Audits is to check chosen set of standards from OH Policies 1-3. These standards were also monitored in the 2010 regular compliance process via the self-assessment questionnaire. Furthermore, before performing the Compliance Audit, the Audit Team makes recommendations to the audited TSO to prepare the evidence or documentation on compliance with the audited OH standards.

3.3 SCOPE

The scope of a compliance audit encompasses issues which are directly related to the compliance of the audited TSO with the investigated RGCE OH standards and issues which make a general background for the implementation of the OH at the audited TSO.

Directly related issues

Issues directly related to the audited RGCE OH standards:

- Existence of TSO's addenda and/or non-compliance declarations/non-compliance self-reports
- Follow-up of the TSO's mitigation plans to remove the declared non-compliances
- Self-assessment questionnaires of 2010 stored at the ENTSO-E Secretariat related to audited TSO concerning the audited OH standards
- Audit Worksheet 2011
- Information and explanations which the Audit Team receives on site

General background

The compliance audit also encompasses issues of general nature listed below:

- General policies of the audited TSO rules and procedures for the control centre(s) related to the audited standards
- Procedures to control the application of the audited OH standards and their follow-up

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- Procedures to improve the compliance with the audited OH standards
- TSO's internal report related to the implementation of the audited OH standards
- TSO's internal audits and/or documentation concerning implementation of OH standards
- TSO's internal bodies (forums, panels) for the implementation of the OH standards

3.4 METHODOLOGY

The CME group prepared an audit schedule defining the chronological order of the compliance audit, which the audited TSO accepted without comment. The audit team reviewed the existing material on the audited TSO and its neighbouring TSOs already collected through the self-assessment process in the 2010 self-assessment questionnaires. It also processed (assessed) the answers in the 2011 Audit Worksheet filled in by the audited TSO.

The methodology includes audit criteria and expectations based on best practices. The adopted criteria are objective, measurable (if possible), complete and relevant to the objectives. At defining the audit methodology, the auditors identify the potential sources of audit evidence and estimate the amount and type of evidence needed.

The audit team uses an Audit Worksheet (AW) (see chapter 4) for reviewing the audited OH standards. The purpose of the AW is to ensure consistency and fairness. By using the AW the Audit Team documented the material reviewed and the observations made. One of the main reasons for an on-site visit is to review the existing documentation and to interview the staff. Thus, the auditors obtain "objective evidence" which support the self-assessed declarations of the audited TSO. The audit team determines whether the evidence presented by the TSO is sufficient. They do this by assessing the relevance, validity and reliability of the information and documentation presented.

It is the responsibility of the audited TSO to provide evidence of compliance with all audited OH standards. In most cases the evidence is in written form like documents, plans, programs or records. In some cases the evidence is a review of computerized records or additional supporting material provided at interviews with the staff of the audited TSO.

3.5 EVALUATION PRINCIPLES

Preparatory phase – activities in charge of Audited TSO

- Inspection of the exact wording of each audited OH standard and of additional questions formulated by the CME
- The TSO must fill in the audit questionnaire and submit to the audit team before the audit
- Identification of documents and other material the TSO has to present to the auditors in order to demonstrate its compliance level with each OH standard

Preparatory phase – activities in charge of CME Audit team

- Identification of compliance level declaration inconsistency with neighbouring TSOs (Self-assessment questionnaire 2010 cross-border check regarding compliance level declarations)
- Analysis of the explanations and comments which the audited TSO made in the self-assessment 2010 and audit questionnaires 2011 in written form in order to evaluate the quality of explanations and comments.
- Identification of the missing explanations in the self-assessment 2010 and audit questionnaires 2011
- Analysis of the improvements achieved during the implementation of mitigation and improvement plans declared in the MLA Addendum/Addenda, in the self-assessment questionnaire 2010 and in the Audit Worksheet 2011 in case of non compliance and sufficient compliance

Audit phase

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- Request to the audited TSO to give additional explanations, especially related to standards which were not or not fully addressed by documents and other material mentioned in the self-assessment questionnaire 2010 and audit questionnaire 2011.
    - The goal is to improve the quality of the explanations
- Request to the audited TSO to present that evidence and, if necessary, additional evidence, in printed or electronic form
    - The goal is to improve the quality of the presented evidence
    - The presented material must be relevant to the audited OH standard at all,
- Request to the audited TSO to remark the titles of all presented documents, their relevant chapters and even relevant passages
- Request to the audited TSO to provide further written explanations related to the presented material

3.6 CONFIDENTIALITY

By signing this report the audit team members assure that they will maintain the confidentiality of information obtained during the compliance audit and drafting of the audit report. Moreover, they express their readiness to sign a supplementary confidentiality agreement, if the audited TSO assert such a claim.

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4 AUDIT WORK SHEET

4.1 P1-A-S1.1 PRIMARY CONTROL ORGANISATION PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P1-A-S1.1.

PRIMARY CONTROL Organisation. An organisational procedure to coverrequirements and obligations for PRIMARY CONTROl actions and reservesperformed by third parties in the CONTROL AREA including a monitoringprocedure must be in place (e.g. GridCode, regulation, associationagreement or contract).

Compliance Level: FC

Additional Questions

Do you have a formal procedure in place to ensure compliance with this standard?

What level of legal support does the procedure entitle? (i.e. law, grid code, agreement, other)

How do you monitor the primary control response of your Control area? (i.e. as a whole, for each single generation unit, etc. Timeframe: realtime/retrospective)

AUDIT QUESTIONNAIRE 2011

P1-A-S1.1 PRIMARY CONTROL Organisation. An organisational procedure to cover requirements and obligations for PRIMARY CONTROL actions and reserves performed by third parties in the CONTROL AREA including a monitoring procedure must be in place (e.g. Grid Code, regulation, association agreement or contract).

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

Energinet.dk has Grid Code for requirement and the volumes are purchased every day for day ahead through an auction.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you have a formal procedure in place to ensure compliance with this standard?

Yes ☒ No ☐

List of evidences, comments:

The units delivering these reserves are approved before they can participate in the auction. (Chapter 3.4 in Tender conditions. Doc 8871/11 v1) [1]

The central power plants shall prove the capability after every revision. (T.F. 5.4.1 Doc. no 31362/08_v1) [2]

Example of approval test for small unit. [3]

Example of approval test for central power plant. [4]

Example of approval test for electrical boiler. [5]

What level of legal support does the procedure entitle? (i.e. law, grid code, agreement, other)

According to law no. LBK 516, BEK 1463 and grid code named "Ancillary services to be delivered in Denmark."

List of evidences, comments:

"Ancillary services to be delivered in Denmark." Tender condition. (Chapter 1.1 in Tender conditions. Doc 8871/11 v1) [1]

Law: LBK 516 [6]

paragraph 28, section 2 no 13

paragraph 31, section 1

paragraph 32, section 1

Law: BEK 1463 [7]

paragraph 7, section 1 no 4

How do you monitor the primary control response of your Control area? (i.e. as a whole, for each single generation unit, etc. timeframe: realtime/retrospective)

After an event with a frequency deviation we ask suppliers for measurements. (Chapter 1.1.3 in Tender conditions. Doc 8871/11 v1). This is done once or twice a year.

List of evidences, comments:

Example of a document after an event. [8]

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk presents the document “Ancillary services to be delivered in Denmark” (last update January 2011), chapter 1.1 Primary reserve DK1. Energinet.dk buys primary reserves at daily auctions. The requirement is published on Energinet.dk’s website. In 2011, the requirement is +/-27 MW. Chapter 3.4 contains the “approval procedure for suppliers”. Chapter 1.1.3 contains the “monitoring of the primary response of the control area, checking the services”.

In the document “Revisionsplanlaeging” the documentation that the suppliers of primary reserve have to deliver is described (internal certification). Examples of approval tests are presented: small gas power plant Grongas, test on 04/03/2011; big coal power plant Fynsvaerket block 7, test on 11/10/2010. In both test the frequency response is shown in diagrams.

Energinet. dk presents the text of the law LBK 516 [6] published on 20/05/2010, paragraph 28, section 2 no 13, paragraph 31, section 1, paragraph 32, section 1, and of the law BEK 1463, published on 19/12/2005.

Energinet.dk presents an example of report on the response of gas engine MAK, plant 1, engine 1 and 2 after outage on 02/09/2011 (one engine performed good, the other one didn’t).

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

4.2 P1-B-S4 SECONDARY CONTROL RESERVE

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P1-B-S4.

SECONDARY CONTROL RESERVE. An adequate SECONDARY CONTROL RESERVE must be available to cover expected DEMAND and generation fluctuations. If the loss of the largest generating unit of the CONTROL AREA is not already covered by the requisite SECONDARY CONTROL RESERVE, additional TERTIARY CONTROL RESERVE (see -> P1-C) has to be activated to offset the shortfall within the required time (see P1-B-S2.1).

Compliance Level: FC

Additional Questions

Does the sum of allocated Secondary and Tertiary Reserve cover normally and within the required time the loss of the largest generation unit connected in your control area?

How does your TSO monitor and report about the technical availability of TERTIARY RESERVE?

AUDIT QUESTIONNAIRE 2011

P1-B-S4 SECONDARY CONTROL RESERVE. An adequate SECONDARY CONTROL RESERVE must be available to cover expected DEMAND and generation fluctuations. If the loss of the largest generating unit of the CONTROL AREA is not already covered by the requisite SECONDARY CONTROL RESERVE, additional TERTIARY CONTROL RESERVE (see P1-C) has to be activated to offset the shortfall within the required time (see P1-B-S2.1).

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

By means of prognosis for consumption, wind power and grid losses power schedules from Production Responsible Parties and exchanged power on AC lines and HVDC links (different ramping rates) an imbalance is calculated prior to every hour. Activation of tertiary reserves is then ordered in 5 minutes power resolution. The uncertainties in this calculation are in the operating hour covered by the +/- 90 MW secondary reserve.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Does the sum of allocated Secondary and Tertiary Reserve cover normally and within the required time (Secondary: 15 min and Tertiary: 30 min) the loss of the largest generation unit connected in your control area?

Yes ☒ No ☐

List of evidences, comments:

Example of daily calculation of amount for tertiary auction. [1]

How does your TSO monitor and report about the technical availability of TERTIARY RESERVE?

It is continuous in accordance with Nordic Operational Information System (NOIS)

List of evidences, comments:

Screen dumps from: NOIS for tertiary reserves. [2]

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk provides the snapshot of the tool available in the control room. This tool assesses the secondary control reserve (+/- 90 MW).

Energinet.dk has a need of 680 MW for the sum of the secondary and tertiary reserves. Example: 90 MW is the automatic secondary reserve, 39 MW are produced by a black start GT, 300 MW are imported from the DK2 part of the grid (the transmission capacity from DK2 to DK1 is normally free, because the normal flow is from DK1 to DK2). Finally, 251 MW is bought at auctions market. The reserves to be auctioned are calculated every hour (there are ca. 100 participants; CHP plants). The participants are not obliged to bid, but they do, because they have an economic interest (till audit day, it has never happened that there were not enough bids). Energinet.dk considers the tripping of HVDC lines in the same way as generators for the purpose of dimensioning the total need for reserves.

A screen dump from the "Nordic Operation Information System", NOIS, was presented. It shows available up and down regulating bids from all Nordic TSO-areas. A bid from DK2 was highlighted ready for activation.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

4.3 P2-A-S4 General Agreements between UCTE System Operators who are affected by cross border scheduling

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P2-A-S5.	
General Agreements between neighbouring CONTROL AREAS. For automaticmatching neighbouring CONTROL AREAS have to document their agreement forcommon rules for their border. Rules relevant for Market Parties must be publishedor communicated towards the parties in question. This document has to contain:	
Compliance Level:	
Additional Questions	
Do you perform automatic matching with your neighbouring CONTROL AREAS?	yes
Do you have documented agreements on automatic matching with your neighbours?	yes
Do you have agreements which define the contents and granularity of the exchanged CAS in order to allow sufficient matching?	yes
Do the agreements include timing for processes (e.g. exchange of programs, matching, day ahead and intra day process, Gate Closure, Cut-Off Time)?	yes
How are the relevant rules communicated to the Market Parties?	
Do you have rules which are agreed in advance to solve mismatches at Cut-Off Time?	yes
Do the agreed responsibilities assignation follow the “Implementation Guide for the ESS (ETSO Scheduling System) in the UCTE processes”?	yes

AUDIT QUESTIONNAIRE 2011

P2-A-S4 General Agreements between UCTE System Operators who are affected by cross border scheduling. For performing a proper matching process and especially for cases of troubleshooting the UCTE bodies (Control Areas, Control Blocks and CO-ORDINATION CENTRES) have to document common agreed rules e.g.

A-S-4.1 Agreed MTFS and number of digits

A-S-4.2 Solution for mismatches (see Guidelines)

A-S-4.3 Troubleshooting in case of problems with data exchange and matching process.

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(see P2-A-G2 & P2-A-G3 & P2-A-G4)

Compliance level FOR P2-A-S4 **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

Energinet.dk as a TSO not being control area operator has a prober matching process and troubleshooting procedure agreed with TenneT TSO GmbH (in the following abbreviated TenneT).

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you have common agreed documents with corresponding ENTSO-E bodies for Scheduling of Power Exchange?

Yes ☒ No ☐

List of evidences, comments:

Agreement on Grid and System Operation Management. [1]

The TenneT control area and the Energinet.dk area are part of the German

control block. Amprion is the control block operator of the German control block.

The Energinet.dk area is part of the TenneT control area, but it is in principle handled as if it was its own control area.

Do you have an agreement which specifies MTFS (Multi Time Frame System) and number of digits?

Yes ☒ No ☐

List of evidences, comments:

Agreed with TenneT and Amprion to use the agreed data. There is no signed document.

What procedure do you apply for solving mismatches?

Single side matching.

List of evidences, comments:

If there is a mismatch the schedule from Energinet.dk and TenneT. TenneT serves as reference. The Energinet.dk schedule (CAS to TenneT and CAX to Amprion) will be adjusted in order to match the TenneT schedule. The single side matching is done automatically in the Energinet.dk planning system (DPS).

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk presents the “Side letter to the agreement on grid and system operation management between Energinet.dk and E.ON Netz” (agreement with TenneT published on 29/09/2008). In chapter 3.2 it is stated that “the ESS format in its current version supplemented with additional features” is in use.

Energinet.dk considers DK1 as its control area in the sense of Policy 2.

The reference value is always the one established by TenneT. On the other hand, Energinet.dk has implemented an automatic check of its schedules.

Energinet.dk presents a document published on 29/03/2011 “Concept of the introduction of ECAN Standard on the borders TenneT-D/EnDK1 and 50 Hertz/EnDK2”. In chapter “The matching process” it is stated: “The annex 8 of the ENTSO-E So-So guide describes how to match CAS files with different details. The CAS with more details has to compress to the level of the other CAS file”. A table with an example for TenneT follows.

In the same document, chapter “Day-ahead” it is mentioned that in case of troubleshooting the values of TenneT-D are valid.

Market activities are performed within the control room. A dedicated desk is in place and the balance operator is in shift 24/7. The Audit Team visited the control room and Energinet.dk demonstrated the main functions of the balancing tool.

ESS is also implemented in the planning system of Energinet.dk (DPS).

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.4 P2-A-S5 General Agreements between neighbouring CONTROL AREAS

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P2-A-S5.	
General Agreements between neighbouring CONTROL AREAS. For automaticmatching neighbouring CONTROL AREAS have to document their agreement forcommon rules for their border. Rules relevant for Market Parties must be publishedor communicated towards the parties in question. This document has to contain:	
Compliance Level:	
Additional Questions	
Do you perform automatic matching with your neighbouring CONTROL AREAS?	yes
Do you have documented agreements on automatic matching with your neighbours?	yes
Do you have agreements which define the contents and granularity of the exchanged CAS in order to allow sufficient matching?	yes
Do the agreements include timing for processes (e.g. exchange of programs, matching, day ahead and intra day process, Gate Closure, Cut-Off Time)?	yes
How are the relevant rules communicated to the Market Parties?	
Do you have rules which are agreed in advance to solve mismatches at Cut-Off Time?	yes
Do the agreed responsibilities assignation follow the “Implementation Guide for the ESS (ETSO Scheduling System) in the UCTE processes”?	yes

AUDIT QUESTIONNAIRE 2011

P2-A-S5 General Agreements between neighbouring CONTROL AREAS. For automatic matching neighbouring CONTROL AREAS have to document their agreement for common rules for their border. Rules relevant for Market Parties must be published or communicated towards the parties in question. This document has to contain:

A-S-5.1 Identification Code used-either EIC or GS1 (former EAN)

A-S-5.2 Agreement on the contents and granularity of the exchanged CAS (e.g. MTFS, resolution) in order to allow a sufficient matching

A-S-5.3 Agreed timing for processes (e.g. exchange of programs, matching, day ahead and

intra day process, Gate Closure, Cut-Off Time)

A-S-5.4 Rules to solve mismatches at Cut-Off Time

A-S-5.5 Responsibilities (e.g. matching, CAPACITY check)

Neighbouring CONTROL AREAS shall implement and run their matching process according to the "Implementation Guide for the EES (ETSO Scheduling System) in the UCTE processes"

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

Agreement on Grid and System Operation Management, see 4.3 appendix [1] chapter 3.2.

Document "Concept of the introduction of ECAN Standard on the borders

TenneT-D / EnDK1 and 50HzT / EnDK2" (Draft). [1]

Agreement on Handling Intraday Capacity Trading on the German/Danish border. [2]

Vereinbarung Zwischen ELTRA und PEN über den täglicher Ablauf der Tagesauktion ab 25. September 2000. [3]

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you perform matching with your neighbouring CONTROL AREAS?

Yes ☒ No ☐

List of evidences, comments:

If there is a mismatch the schedule from TenneT serves as reference.

The Energinet.dk schedule will be adjusted in order to match the schedule from TenneT.

The single side matching is done automatically in the planning system (DPS).

Example: Screen dump for planning system. [4]

How are the relevant rules communicated to the Market Parties?

The rule is part of the Danish market regulation. It is described in the market regulation C3, which is published on Energinet.dk website.

List of evidences, comments:

Market regulation C3 section 3.2 and 3.4. [5]

http://www.energinet.dk/SiteCollectionDocuments/Engelske%20dokumenter/El/Regulatio

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n%20C3%20Handling%20of%20notifications%20and%20schedules.pdf

AUDIT PHASE

COMPLIANCE AUDIT 2011

Relevant rules for the market parties are published on the internet. The link is: http://www.energinet.dk/EN/El/Forskrifter/Markedsforskrifter/Sider/default.aspx

The agreed timing for the process in day-ahead is mentioned in chapter 1.12 of the document "Regulation C3 Handling of notifications and schedules - daily procedures" (December 2008).

Energinet.dk presents a document published on 29/03/2011 "Concept of the introduction of ECAN Standard on the borders TenneT-D/EnDK1 and 50 Hertz/EnDK2". In chapter "The matching process" it is stated: "The d-a nomination in the TenneT-D area contains long term and day-ahead time series. In the correction cycle only the day-ahead time series could be corrected by the trader." The matching process and the capacity check is in the charge of TenneT-D.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.5 P2-A-S-5.1 IDENTIFICATION CODE USED-EITHER EIC OR GS1 (FORMER EAN)

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P2-A-S5.1.
Identification Code used - either EIC or GS1 (former EAN)
Compliance Level: FC
There are no Questions defined for this company and this policy **Additional Questions**

AUDIT QUESTIONNAIRE 2011

P2-A-S-5.1 Identification Code used-either EIC or GS1 (former EAN)

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

Energnet.dk and TenneT has agreed to use the identification codes.

Example: Screen dump of exchanged file with TenneT. [1]

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk presents a screenshot of exchanged file with TenneT, in which it is visible that the EIC code is in place. This code is in use both when exchanging data with the control area of TenneT, and with market parties.

Compliance Level suggestion by the audit team:

FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.6 P2-A-S-5.2 AGREEMENT ON THE CONTENTS AND GRANULARITY OF THE EXCHANGED CAS (E.G. MTFS, RESOLUTION) IN ORDER TO ALLOW A SUFFICIENT MATCHING

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P2-A-S5.2.
Agreement on the contents and granularity of the exchanged CAS(e.g. MTFS, resolution) in order to allow a sufficient matching
Compliance Level: FC
There are no Questions defined for this company and this policy **Additional Questions**

AUDIT QUESTIONNAIRE 2011

P2-A-S-5.2 Agreement on the contents and granularity of the exchanged CAS (e.g. MTFS, resolution) in order to allow a sufficient matching

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

TenneT and Energinet.dk have an agreement, which regulate the operational collaboration between the parties related to the operation of an intraday market for capacity on the German/Danish border.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you have documented agreements on matching with your neighbours?

Yes ☒ No ☐

List of evidences, comments:

Agreement on Handling Intraday Capacity Trading on the German/Danish border, see 3.4 appendix [2].

Vereinbarung Zwischen ELTRA und PEN über den täglicher Ablauf der Tagesauktion ab 25. September, see 3.4 appendix [3].

Do you have agreements which define the contents and granularity of the exchanged CAS in order to allow sufficient matching?

Yes ☒ No ☐

List of evidences, comments:

Document "Concept of the introduction of ECAN Standard on the borders TenneT D/EnDK1 and 50 HzT/ENDK2" (Draft), see 3.4 appendix [1].

Example: Screen dump with agreed content of CAS file. [1]

AUDIT PHASE

COMPLIANCE AUDIT 2011

In the annex 3 to the document published on 29/03/2011 “Concept of the introduction of ECAN Standard on the borders TenneT-D/EnDK1 and 50 Hertz/EnDK2” the granularity of data exchange is defined: 15 minutes and 1 MW. This guarantees sufficient matching. There are two kinds of schedules: 15 minutes for power and 1 hour for energy.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.7 P2-A-S-5.3 AGREED TIMING FOR PROCESSES (E.G. EXCHANGE OF PROGRAMS, MATCHING, DAY AHEAD AND INTRA DAY PROCESS, GATE CLOSURE, CUT-OFF TIME)

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P2-A-S5.3.
Agreed timing for processes (e.g. exchange of programs, matching,day ahead and intra day process, Gate Closure, Cut-Off Time)
Compliance Level: FC
There are no Questions defined for this company and this policy **Additional Questions**

AUDIT QUESTIONNAIRE 2011

P2-A-S-5.3 Agreed timing for processes (e.g. exchange of programs, matching, day ahead and intra day process, Gate Closure, Cut-Off Time)

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

The agreed timing for processes is agreed with TenneT.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do the agreements include timing for processes (e.g. exchange of programs, matching, day ahead and intraday process, Gate Closure, Cut-Off Time)?

Yes ☒ No ☐

List of evidences, comments:

Document "Concept of the introduction of ECAN Standard on the borders TenneT D/EnDK1 and 50 HzT/EnDK2" (Draft), see 3.4 appendix [1].

AUDIT PHASE

COMPLIANCE AUDIT 2011

In the document “Regulation C3 Handling of notifications and schedules - daily procedures” (December 2008), table 2.2 and chapters 3.2.2, 3.2.3 and 3.2.4, the adequate timing for processes is described.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.8 P2-A-S-5.4 RULES TO SOLVE MISMATCHES AT CUT-OFF TIME

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P2-A-S5.4.
Rules to solve mismatches at Cut-Off Time
Compliance Level: FC
There are no Questions defined for this company and this policy **Additional Questions**

AUDIT QUESTIONNAIRE 2011

P2-A-S-5.4 Rules to solve mismatches at Cut-Off Time

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

The rules for solving mismatches are agreed with TenneT.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you perform matching with your neighbouring CONTROL AREAS?

Yes ☒ No ☐

List of evidences, comments:

If there is a mismatch the schedule from TenneT serves as reference.

The Energinet.dk schedule will be adjusted in order to match the schedule from TenneT.

The single side matching is done automatically in the planning system (DPS).

Example: Screen dump from planning system. [1]

AUDIT PHASE

COMPLIANCE AUDIT 2011

In the document “Regulation C3 Handling of notifications and schedules - daily procedures” (December 2008), chapter 3.2.4 it is stated”

“In case, after the final confirmation report at 16:00, it is discovered that two notifications for electricity trade do not correspond, Energinet.dk will adjust the notifications according to the following rules:

- In case of discrepancy between two trading notifications, Energinet.dk will adjust one notification so that the numerically lowest value will apply, i.e. the electricity trade will be limited.
- In case the two trading notifications are numerically equal, but have the same sign, Energinet.dk will adjust both trading notifications to 0.
- In case a BRP has submitted a trading notification and his counterpart has not submitted a corresponding notification, Energinet.dk will adjust the BRP’s trading notification to 0, i.e. corresponding to a situation where the counterpart had submitted a trading notification with the value 0.”

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.9 P2-A-S-5.5 RESPONSIBILITIES (E.G. MATCHING, CAPACITY CHECK)

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P2-A-S5.5.
Responsibilities (e.g. matching, CAPACITY check)Neighbouring CONTROL AREAS shall implement and run their matching processaccording to the "Implementation Guide for the ESS (ETSO Scheduling System) inthe UCTE processes".
Compliance Level: FC
There are no Questions defined for this company and this policy **Additional Questions**

AUDIT QUESTIONNAIRE 2011

P2-A-S-5.5 Responsibilities (e.g. matching, CAPACITY check)

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

The responsibilities are agreed with TenneT.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Does the agreed responsibilities assignation follow the "Implementation Guide for the ESS (ETSO Scheduling System) in the UCTE processes"?

Yes ☒ No ☐

List of evidences, comments:

Document "Concept of the introduction of ECAN Standard on the borders.

TenneT D/EnDK1 and 50 HzT/En DK2" (Draft), see 3.4 appendix [1].

AUDIT PHASE

COMPLIANCE AUDIT 2011

The procedure to check that at any time the nominated schedule of each market party does not exceed the corresponding allocated capacity is in charge of TenneT-D.

Energinet.dk presents a document published on 29/03/2011 “Concept of the introduction of ECAN Standard on the borders TenneT-D/EnDK1 and 50 Hertz/EnDK2”. In chapter “Intraday” it is stated: “TenneT-D calculates the intraday offered capacity (minimum) and sends these documents to the DBS platform. ENDk gets an agreed offered capacity from TenneT-D. In the case that EnDk doesn’t send the proposed offered capacity till d-1 17:00 the intraday procedure doesn’t start.”

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.10 P3-A1-S2 COORDINATION FOR EXCEPTIONAL TYPE OF CONTINGENCY

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A1-S2.

Coordination for exceptional type of contingency. It is the responsibility of theoperator of the concerned network elements to establish the list of the exceptionaltype of contingency for security calculation based on the likelihood of occurrence ofthe event and to communicate this list to the neighboring TSOs. Each TSO selectsthese exceptional contingencies based on the respective risk assessment by itself(see P3-A2-S1). Some exceptional events are considered only in case of temporaryspecific operational conditions, which have to be communicated to neighbors with aview of security calculation.If a TSO A considers a resulting risk for an exceptional type of contingency forelements located in the area of TSO B not considered in the contingency list of TSOB, both TSOs reconsider together their contingency lists.

Compliance Level: SC

transpower
SC

Actions taken to reach compliance:

See existing Addendum. A list of exceptional types of contingencies based on a risk assessment is not established. In case of the risk of an exceptional contingency, analysis are made on the influence on the neighboring system.

Deadline: 7\2011

Additional Questions

Do you establish and communicate to other TSOs a formal list of exceptional contingencies?

transpower
no

Do you consider the exceptional list from the neighbouring TSOs and reconsider your own contingency list with your neighbour TSO if needed?

transpower
no

How do you coordinate with your neighbouring TSOs the exceptional contingency list as of what to take into account and how to manage the list?

transpower

AUDIT QUESTIONNAIRE 2011

P3-A1-S2 COORDINATION FOR EXCEPTIONAL TYPE OF CONTINGENCY. It is the responsibility of the operator of the concerned network elements to establish the list of the exceptional type of contingency for security calculation based on the likelihood of occurrence of the event and to communicate this list to the neighbouring TSOs. Each TSO selects these exceptional contingencies based on the respective risk assessment by itself (see P3-A2-S1). Some exceptional events are considered only in case of temporary specific operational conditions, which have to be communicated to neighbours with a view of security calculation.

If a TSO A considers a resulting risk for an exceptional type of contingency for elements located in the area of TSO B not considered in the contingency list of TSO B, both TSOs reconsider together their contingency lists.

Overall Compliance level **FC** ☐ **SC** ☒ **NC** ☐

Neighbour	Compliance level
TenneT	FC

Concise explanation for declared compliance level:

Energinet.dk has not previously established a list of exceptional contingencies and we do not include exceptional contingencies in the N-1 calculations. Firstly, we consider the likelihood of occurrence of these contingencies very low and secondly, in the case of busbar faults, the consequences are limited due to two-breaker busbar layout in the 400 kV stations, see examples in [1]. For these two reasons we consider Energinet.dk sufficiently compliant with this standard.

Do you have an addendum to the standard? **Yes** ☒ **No** ☐

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Please find existing addendum in [2] to be completed by 07/2012.

Do you establish and communicate to other TSOs a formal list of exceptional contingencies?

Neighbour	Yes	No
TenneT		X

List of evidences, comments:

As described above, so far exceptional contingencies such as double line faults and busbar faults have not been considered in the N-1 calculations. In case of increased risk of galloping overhead lines influencing neighbouring areas the necessary actions are taken and neighbours are informed according to existing instructions, see [3].

Do you consider the exceptional list from the neighbouring TSOs and reconsider your own contingency list with your neighbour TSO if needed?

Neighbour	Yes	No
TenneT		X

List of evidences, comments:

Energinet.dk received a list of exceptional contingencies in September 2010, but with the existing tools for N-1 calculations we are not able to include them in the calculations. For the list of exceptional contingencies see [4].

How do you coordinate with your neighbouring TSOs the exceptional contingency list as of what to take into account and how to manage the list?

Neighbour	Explanation

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TenneT	We have informed TenneT that we are not able to include the exceptional contingencies from their area and that we have not established a list of exceptional contingencies for our area.

List of evidences, comments:

For mail sent to TenneT, see [5].

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk presents a document in which the galloping on transmission lines is described in the sense of exceptional contingencies. The staff of the control centre reacts whenever galloping overhead lines are observed in the 150 kV or 400 kV transmission grid. Normally, galloping overhead lines are firstly observed in the Western part of the country. In this area there are only 150 kV lines which have no critical impact on neighbouring areas.

This is the only kind of exceptional contingencies Energinet.dk considers. There are no other exceptional contingencies. This fact has, however, not been communicated formally to TenneT Germany.

Compliance Level suggestion by the audit team:
NC

Explanation for the suggested compliance level:
There is a valid addendum.

Mitigation plan with deadline:
Performing of a study to show whether there are exceptional contingencies.
Share with TenneT Germany the results of the study and/or that there are no exceptional contingencies in the Danish system.
Deadline: July 2012, but the Audit Team propose to do this faster and to inform the Plenary that full compliance is reached.

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4.11 P3-A2-S1 DETERMINATION OF THE EXTERNAL CONTINGENCY LIST AND OBSERVABILITY AREA.

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A2-S1.

Determination of the external contingency list and observability area.. EachTSO is required to determine the external contingency list and the externalobservability list related to its responsibility area. External contingency list items mustbe treated as normal type of contingencies in all N-1 security calculations in all timeframes. Additionally exceptional contingencies (double lines, busbars) as announcedby a neighboring TSO have to be included by the TSO if it considers them veryrelevant for risks.

Compliance Level: SC

transpower
SC

Actions taken to reach compliance:

Existing Addendum Determination of the external contingency list and the observability area should be based on the determination of the Observability influence threshold. As the method for determining this threshold values has not yet been developed the contingency list and the observability area has not been determined on this basis. An external contingency list is available in the bilateral agreement between ENDK and Transpower. This list is developed on the basis of operational experience an

Deadline: 7\2011

There are no Questions defined for this company and this policy!

Additional Questions

AUDIT QUESTIONNAIRE 2011

P3-A2-S1 Determination of the external contingency list and observability area. Each TSO is required to determine the external contingency list and the external observability list related to its responsibility area. External contingency list items must be treated as normal

type of contingencies in all N-1 security calculations in all timeframes. Additionally exceptional contingencies (double lines, bus-bars) as announced by a neighboring TSO have to be included by the TSO if it considers them very relevant for risks.

Overall Compliance level **FC** ☐ **SC** ☒ **NC** ☐

Neighbour	Compliance level
TenneT	SC

Concise explanation for declared compliance level:

Determination of the external contingency list and the observability area should be based on the determination of the observability influence threshold. As the method for determining this threshold values has not yet been developed the contingency list and the observability area have not been determined on this basis. An external contingency list is available in the bilateral agreement between ENDK and TenneT. This list is developed on the basis of operational experience and is not included in regularly in the N-1 calculations

Do you have an addendum to the standard? **Yes** ☒ **No** ☐

In case of an existing addendum; list of evidences for a mitigation plan, comments:

See existing addendum [1] to be completed by 07/2012.

Do you determine the external contingency list? If yes how often do update it?

As the method for determining the threshold values has not yet been developed the external contingency list and the observability area have not been determined on this basis. An external contingency list is available in the bilateral agreement between ENDK and TenneT. This list is developed on the basis of operational experience and is not included in regularly in the N-1 calculations.

List of evidences, comments:

See contingency list in bilateral agreement [2].

Is your external contingency list integrated in all your N-1 security calculations?

Yes ☐ No ☒

List of evidences, comments:

See comment above.

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk presents the annex to the bilateral agreement with TenneT published on 02/07/2008 ("Side letter to the agreement on grid and System operation management between Energinet.dk and E.ON Netz"), in which external grid elements that belong to the external contingency list are specified. These elements (in Germany) are included into the Danish analysis (they are part of the observability area), but the n-1 outages of these elements themselves are not considered.

Compliance Level suggestion by the audit team:
SC

Explanation for the suggested compliance level:
There is a valid addendum. This would automatically mean "non-compliance", but Energinet.dk has presented proves (i.e. the external contingency list) which justify a higher compliance level (sufficiently compliant). .

Improvement plan with deadline:
Energinet.dk will perform a study to show that the outages of grid elements abroad don't have any significant impact on the Danish grid. The conclusion will be that these grid elements don't need to be taken into account within the scope of n-1 security calculations.
Deadline: July 2012, but the Audit Team propose to do this faster and to inform the Plenary that full compliance is reached.

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4.12 P3-A2-S2 IMPLEMENTATION OF OBSERVABILITY AREA

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A2-S2.

Implementation of observability area. The external network model correspondingto the observability area must be implemented in the SCADA system and its real-timeobservability by state estimator must be ensured by a proper amount of exchangedonline data.

Compliance Level: SC

Actions taken to reach compliance:

Have to be implementet in new SCADA system

Deadline: 7\2011

There are no Questions defined for this company and this policy!

Additional Questions

AUDIT QUESTIONNAIRE 2011

P3-A2-S2 Implementation of observability area. The external network model corresponding to the observability area must be implemented in the SCADA system and its real-time observability by state estimator must be ensured by a proper amount of exchanged online data.

Overall Compliance level **FC** ☐ **SC** ☒ **NC** ☐

Neighbour	Compliance level
TenneT	SC

Concise explanation for declared compliance level:

A part of the grid in Northern Germany is already implemented in the existing tool used for contingency analysis. N-1 security is obtained by having the contingency list in the bilateral agreement between ENDK and TenneT and by exchanging information regarding outages etc. The SCADA system is under development for contingency analysis.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Is the observability area implemented in the SCADA? If yes how often do update it?

As mentioned above the SCADA system is under development for contingency analysis. It is expected that the observability area will be extended in order to include external contingencies in N-1 calculations. The implementation is awaiting the establishment of external contingency list and observability area as well as the development of the EMS system.

List of evidences, comments:

Do you have a proper amount of exchanged online data to ensure the real time observability by the state estimator

Yes ☒ No ☐

List of evidences, comments:

When the external contingency list and the observability area have been established based on numerical method the amount of online data may have to be adjusted but so far ENDK has the proper amount.

AUDIT PHASE

COMPLIANCE AUDIT 2011

The necessary features of the SCADA system have been implemented recently. The corresponding functionalities have been demonstrated to the Audit Team in the control room.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:

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Energinet.dk recently improved the observability area in its system i.e. the declaration of “sufficient compliance” is obsolete.

Improvement/Mitigation plan with deadline:
n/a

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4.13 P3-A2-S5.2 ABROAD CONSEQUENCES OF TSOS DECISIONS IN OPERATIONAL PLANNING AND IN REAL TIME

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A2-S5.2.

Abroad consequences of TSOs decisions in operational planning andin real time. In case of changing the network configuration for networkbranches included in the external observability list of neighbors (e.g. outageof elements, double busbar operation) or major changes of generationpattern, the TSO must inform in due time and firstly in the operationalplanning phase its affected neighbors2. If needed corresponding measureshave to be coordinated to prevent counter-effects in neighboring networks.

Compliance Level: FC

transpower
FC

Additional Questions

Have you implemented a procedure ensuring exchange of information related to changes of network configuration or major changes of generation pattern in operational planning and real time operation?

transpower
yes

Do you have any agreed procedures in which counter measures to prevent counter-effect in neighbouring networks are determined?

transpower
yes

AUDIT QUESTIONNAIRE 2011

P3-A2-S5.2 ABROAD CONSEQUENCES OF TSOS DECISIONS IN OPERATIONAL PLANNING AND IN REAL TIME. In case of changing the network configuration for network branches included in the external observability list of neighbours (e.g. outage of elements, double busbar operation) or major changes of generation pattern, the TSO must inform in due time and firstly in the operational planning phase its affected neighbours. If needed corresponding measures have to be coordinated to prevent counter-effects in neighbouring networks.

Overall Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Neighbour	Compliance level
TenneT	FC

Concise explanation for declared compliance level:

Every week information is sent to TenneT regarding outages and limitations of transfer capability, see example of such a list in [1]

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Have you implemented a procedure ensuring exchange of information related to changes of network configuration or major changes of generation pattern in operational planning and real time operation?

Neighbour	Yes	No
TenneT	X	

List of evidences, comments:

See example in [1].

Do you have any agreed procedures in which counter measures to prevent counter-effect in neighbouring networks are determined?

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Neighbour	Yes	No
TenneT		X

List of evidences, comments:

It has not been considered necessary so far.

AUDIT PHASE

COMPLIANCE AUDIT 2011

Every week, information is communicated (by phone calls that are recorded) to TenneT regarding outages and limitations of transfer capability. “The contracting parties inform each other immediately about all unplanned modifications of the switching state as far as they may affect the operation of the other contracting party’s grid” (bilateral agreement with TenneT published on 02/07/2008, chapter 3.4.3). The outage planning is coordinated with TenneT.

Energinet.dk presents an example of the yearly outage plan which is sent to TenneT by mail. Joint meetings and conferences take place on regular basis.

Energinet.dk doesn’t have agreed procedures with TenneT through which corresponding measures to prevent counter-effects in neighbouring networks are coordinated. Counter measures are not considered needed. There’s only one double circuit 380 kV tie-line which connects DK1 to the German grid and Energinet.dk implements a commonly agreed protection settings which avoid cascading effects.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

4.14 P3-A2-S6 DATA PROVISION

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A2-S6.

Data provision. The TSO has to provide its neighbors in due time with all neededinformation for adequate simulations.Each TSO must provide the real-time telemetry and the network characteristics to itsneighbors that is necessary for the neighboring TSOs to have a sufficient externalnetwork model of the observability area for the state estimator and for the N-1security calculations. This implies among others all data related to switching status,active and reactive power flows, voltage, injections and loads, tap changer position oftransformers.

Compliance Level: N / A

transpower
FC

Additional Questions

Do you have an agreement with your neighbouring TSOs which precises in details what data have to be exchanged concerning the network elements identified in the observability area ?

transpower
yes

What kind of communication methods do you use for data provision? (e.g. email, data server,...)

transpower
Online exchange of the network data stated in the bilateral agreement.

AUDIT QUESTIONNAIRE 2011

P3-A2-S6 DATA PROVISION. The TSO has to provide its neighbors in due time with all needed information for adequate simulations. Each TSO must provide the real-time telemetry and the network characteristics to its neighbors that is necessary for the neighboring TSOs to have a sufficient external network model of the observability area for the state estimator and for the N-1 security calculations. This implies among others all data related to switching status, active and reactive power flows, voltage, injections and loads, tap changer position of transformers.

Overall Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Neighbour	Compliance level
TenneT	FC

Concise explanation for declared compliance level:

All necessary data is provided to the neighbours upon request.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you have an agreement with your neighbouring TSOs which describe in detail what data have to be exchanged concerning the network elements identified in the observability area?

Neighbour	Yes	No
TenneT		X
Amprion		X

List of evidences, comments:

We do not have a general agreement with our neighbours which describes in detail the data that has to be interchanged but we provide all necessary data on request from our neighbours and vice versa. For list of provided measurements, see [1].

Do you provide the realtime telemetry necessary for the state estimator and for the N-1 calculations to the neighbouring TSOs? (to be asked border by border),...)

Neighbour	Yes	No

TenneT	X	
Amprion	X	

List of evidences, comments:

See [1]

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk presents an example of data keys (list of information implemented in the SCADA systems) sent to Amprion as German control block leader (via Electronic Highway).

An example of request for data exchange which include grid characteristics is shown too (mail on 14/09/2011).

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
(n/a)

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4.15 P3-A3-S2 "OVERLOADS IN N-1 SITUATION (SIMULATION)

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A3-S2.

Overloads in N-1 situation (simulation). Considering the loss of a network element(N-1 situation) overloads on impacted network elements are admitted only if remedialactions are available as to get back any overloaded network element below itsrespective Permanent Admissible Transmission Loading PATL.

Compliance Level: FC

Additional Questions

Which measures do you take if there is no possible remedial action in terms of topological modifications and generation redispatching available in such a case? (That means remedial actions allowed by laws, regulators, which can be applied in such a situation, but which are not prepared in advance for regular application, e.g. no contracts,...)

Load-shedding

If a remedial action is considered as "available", which time lag is taken into account for this action to become effective?

Normally within 15 min.

AUDIT QUESTIONNAIRE 2011

P3-A3-S2 "OVERLOADS IN N-1 SITUATION (SIMULATION). Considering the loss of a network element (N-1 situation) overloads on impacted network elements are admitted only if remedial actions are available as to get back any overloaded network element below its respective Permanent Admissible Transmission Loading PATL."

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

ENDK utilises short term overload capability in N-1 calculations, normal short term overload capability equals 125 % of nominal capacity (equal to 15 min. rating on overhead lines). We do not consider this as overload since it is within acceptable line ratings. It is always possible to remove overloads on the transmission system by re-dispatching of either HVDC or power plants.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Which measures do you take if there is no possible remedial action in terms of topological modifications and generation redispatching available in such a case? (That means remedial actions allowed by laws, regulators, which can be applied in such a situation, but which are not prepared in advance for regular application, e.g. no contracts,...)

The TSO can use whatever means available to restore system stability, this means using curtailment of wind and CHP and even disconnecting consumers.

List of evidences, comments:

See [1]

If a remedial action is considered as "available", which time lag is taken into account for this action to become effective?

Load limits are always calculated so they allow at least 15 min. for the remedial actions to be effective.

List of evidences, comments:

See [2]. This is from the Nordic grid code (Eastern Denmark) but the same goes for Western Denmark.

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk doesn't have a written list of remedial actions for potential overloads. Overload of grid elements, if it occurs, is in most cases caused by large transits to Germany (with large import from Norway and Sweden). Energinet.dk is always capable to reduce such overloads through reducing the imports in the north.

Energinet.dk performs n-1 analysis on the day-ahead basis and frequently during the day of operation. The remedial actions needed to be implemented if overload occurs are the dispatchers' responsibility in cooperation with the on-duty power system engineer and most often obvious in the overload situations that can occur in the DK1 grid. So, a list of remedial actions is not written down for each potential overload.

At dispatcher training, remedial actions are part of the training program performed during practice as on-the-job training by experienced dispatcher to practicing dispatcher (oral transfer of knowledge and trained if overload of grid elements occurs).

Compliance Level suggestion by the audit team:
NC

Explanation for the suggested compliance level:
Energinet.dk doesn't fulfil the requirement to have a list of remedial actions.

Mitigation plan with deadline:

Energinet.dk will prepare a list of remedial actions in order to standardize best practice and to improve the exchange of knowledge. Deadline: end of 2011.

Documentation forwarded after the on-site audit:
Two general instructions exist, one for day-ahead planning and one for the day of operation.
Day-ahead instruction doc. no. 252214 (in Danish, the main title, index, last update and part of content translated into English): "Instruktion Systemdrift El-Vest Driftsplanlægningskriterier kan ikke overholdes 24. maj 2006 Rev. 0"
Day of operation instruction doc. no. 221786 (in Danish, the main title, index, last update and part of content translated into English): "Instruktion Systemdrift El-Vest Driftsgrænser kan ikke overholdes 28. marts 2006 Rev. 0"

The Audit Team acknowledges the additional evidences submitted by Energinet.dk before the end of finalisation of Compliance Audit Reports (comment phase of 4 weeks after the audit). The additional documentation can be understood as a part of the actions requested to fulfil the mitigation plan to this standard.

The two instructions provide general recommendations to dispatchers for managing situations of temporary overloads in N-1 situations in the planning phase and in the day of operation and must be improved with specific (and not general) remedial actions for the most relevant constraints.

4.16 P3-A3-S4.1 TIE-LINES OPERATING CONDITIONS

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A3-S4.1.

Tie-lines operating conditions. The information on values of PATL, TATLor couples (TATL

Compliance Level: FC

transpower
FC

Additional Questions

Do you share values of PATL, TATL and TC for all tie-line with adjacent TSOs?

transpower
yes

Do you inform neighbours in case of settings changes at the time of the change?

transpower
yes

AUDIT QUESTIONNAIRE 2011

P3-A3-S4.1 TIE-LINES OPERATING CONDITIONS. The information on values of PATL, TATL or couples (TATL; Duration), overload conditions (acceptable duration of overload), and TC of tie-lines must be shared with adjacent TSOs. Mutual information must be agreed and implemented. In case of settings changes TSO has to inform the adjacent TSO on the new values.

Overall Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Neighbour	Compliance level
TenneT	FC

Concise explanation for declared compliance level:

Information can be found in System-related Review Interconnections Energinet.dk E.ON Netz GmbH (now TenneT) [1]

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you share values of PATL, TATL and TC for all tie-line with adjacent TSOs?

Neighbour	Yes	No
TenneT	X	

List of evidences, comments:

See [1].

Do you inform neighbours in case of settings changes at the time of the change?

Yes ☒ No ☐

List of evidences, comments:

No formal process exists; it is handled from case to case.

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk presents the document published on 06/12/2006 “System related review, interconnections Energinet.dk E.ON Netz” (chapter 7, “Summary of bottleneck currents” – both the thermal limits and protection setting is agreed). In case of any changes Annex 8 of the agreement with TenneT “will be updated and exchanged between the parties”.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations.

Improvement/Mitigation plan with deadline:
n/a

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4.17 P3-A4-S3 PRINCIPLE OF "NO CASCADING WITH IMPACT OUTSIDE MY BORDER"

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A4-S3.

Principle of "No cascading with impact outside my border". TSOs commonlyidentify, prepare and implement in a coordinated way all possible operationalmeasures and remedial actions (doing their best efforts in accordance with their legalframework) so that the simulated situations4 based on the contingency lists cannotlead to the propagation of cascading effects outside their borders.

Compliance Level: FC

transpower
FC

Additional Questions

Do you share datasets and additional information to identify risks of cascading effects on the interconnection by the means of calculations?

transpower
no

Do you define in advance a set of contingencies and relative coordinated remedial actions with neighbouring TSOs?

transpower
no

How do you check the effectiveness of prepared measures for situations based on the contingency list?

transpower
Due to simplicity of the transmission network this is not considered nessesary.

Do you have a procedure to coordinate remedial actions with your neighbouring TSOs in case of detected violations on the interconnection?

transpower

yes

Do you have agreed methods of cost sharing?

transpower
yes

AUDIT QUESTIONNAIRE 2011

P3-A4-S3 PRINCIPLE OF "NO CASCADING WITH IMPACT OUTSIDE MY BORDER". TSOs commonly identify, prepare and implement in a coordinated way all possible operational measures and remedial actions (doing their best efforts in accordance with their legal framework) so that the simulated situations based on the contingency lists cannot lead to the propagation of cascading effects outside their borders.

Overall Compliance level FC ☒ SC ☐ NC ☐

Neighbour	Compliance level
TenneT	FC

Concise explanation for declared compliance level:

Daily simulations are performed, no contingencies in TenneT area are considered, only the tie-lines.

Do you have an addendum to the standard? Yes ☐ No ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you share datasets and additional information to identify risks of cascading effects on the interconnection by the means of calculations?

Neighbour	Yes	No
TenneT		X

List of evidences, comments:

DACF files are sent to Amprion on a daily basis. Besides that only long term planning data are supplied.

Do you define in advance a set of contingencies and relative coordinated remedial actions with neighbouring TSOs?

Neighbour	Yes	No
TenneT		X

List of evidences, comments:

A new EMS tool is under development. Existing tool does not allow calculations of contingencies in neighbouring areas.

How do you check the effectiveness of prepared measures for situations based on the contingency list?

Neighbour	Explanation
TenneT	Load flow calculations used to check effectiveness of prepared
	measures in own area.

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List of evidences, comments:

The result of load flow calculations.

Do you have a procedure to coordinate remedial actions with your neighbouring TSOs in case of detected violations on the interconnection?

Neighbour	Yes	No
TenneT	X	

List of evidences, comments:

Agreement on Grid and System Operation Management gives general instructions. See section 3.5 Cooperation for the maintenance of grid security in [1].

AUDIT PHASE

COMPLIANCE AUDIT 2011

Common operational planning with TenneT takes place on yearly and weekly basis. Only the tie-lines are considered. Energinet.dk presents the side letter to the agreement with TenneT. Energinet.dk and TenneT share the responsibility for tie-lines (introduction of chapter 3). Commonly agreed protection settings to prevent cascading effects.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Cascading effects are avoided by adequate protection setting on tie-lines.

Improvement/Mitigation plan with deadline:
n/a

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4.18 P3-A4-S4.1 REGIONAL AGREEMENT FOR THE SET OF REMEDIAL ACTIONS

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-A4-S4.1.
Regional agreement for the set of remedial actions. For probableconstraints impacting neighboring control areas TSOs have to agree inadvance with their neighbors in the same region on a set of remedialactions and on related procedures of activation.
Compliance Level: FC
transpower FC
Additional Questions Do you have any written agreements on procedures to provide maximal assistance to adjacent TSOs no longer capable to face a critical situation, taking into account cross-border remedial actions. (i.e. changes of network topology, cross-border re-dispatching, counter-trading, NTC curtailment, etc.)? **transpower** yes

AUDIT QUESTIONNAIRE 2011

P3-A4-S4.1 REGIONAL AGREEMENT FOR THE SET OF REMEDIAL ACTIONS. For probable constraints impacting neighboring control areas TSOs have to agree in advance with their neighbors in the same region on a set of remedial actions and on related procedures of activation.

Overall Compliance level FC ☒ SC ☐ NC ☐

Neighbour	Compliance level
TenneT	FC

Concise explanation for declared compliance level:

Defined in Bilateral TSO Agreement between E.ON Netz (now TenneT) and ENDK, see 3.17 appendix [1].

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Have you agreed with your neighbouring TSOs in the same region on a set of remedial actions and on activation of related procedures for probable constraints impacting neighbouring control areas?

Yes ☒ No ☐

List of evidences, comments:

See 3.17 appendix [1].

AUDIT PHASE

COMPLIANCE AUDIT 2011

Energinet.dk claims that there are no probable constraints impacting neighbouring areas (TenneT). Constraints can be avoided by limiting the transit between Denmark and Germany (this is the only remedial action, mentioned in Annex 13 of the agreement with TenneT). The threshold not to be surpassed is established by Energinet.dk.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
In principle, the explanation given is self-explanatory and sufficient.
Recommendation: the thresholds established by Energinet.dk for tie-lines should be shared with TenneT.

Improvement/Mitigation plan with deadline:
n/a

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4.19 P3-B-S1.2.2 OTHER REACTIVE POWER GENERATION/ABSORPTION RESOURCES

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-B-S1.2.2.
Other REACTIVE POWER generation/absorption resources. TSOshave to keep available a sufficient number of other reactive powersources like generators, capacitors and reactors connected to the grid,which contribute to REACTIVE POWER generation or absorption, inorder to maintain or get back the voltage in normal ranges after anycontingency.
Compliance Level: FC
Additional Questions
Do you check regularly whether you have a sufficient additional reserve of reactive power in order to recover the normal range in N-1 situation — yes
Do you have information about the availability/restriction of reactive power reserves? — yes
Do you have any contracts with adjacent TSOs for the exchange of reactive power reserve in case of necessity (e.g. voltage margins violations)?

AUDIT QUESTIONNAIRE 2011

P3-B-S1.2.2 OTHER REACTIVE POWER GENERATION/ABSORPTION RESOURCES. TSOs have to keep available a sufficient number of other reactive power sources like generators, capacitors and reactors connected to the grid, which contribute to REACTIVE POWER generation or absorption, in order to maintain or get back the voltage in normal ranges after any contingency.

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

A number of capacitors, reactors, synchronous units and generators are connected to the transmission grid. The units are placed on 400 kV level, 150 kV level and 60 kV level. On 400 kV level there are capacitors, reactors and generators. On 150 kV level there are capacitors, reactors, synchronous units and generators. On 60 kV level there are capacitors and generators. Examples see [1].

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you check regularly whether you have a sufficient additional reserve of reactive power in order to recover the normal range in N-1 situation?

Yes ☒ No ☐

List of evidences, comments:

We check if there is additional reactive power in order to fulfil N-1 situation. It is not possible to make online calculation on reactive power reserves, but it is possible to see if there is a surplus of reactive power. If there is a surplus we have a plan for "restoration" of reactive power. This plan is only available, if there is a surplus of reactive power [2].

Do you have information about the availability/restriction of reactive power reserves?

Yes ☒ No ☐

List of evidences, comments:

There is a plan for maintenance on capacitors, reactors, synchronous machines and generators. This plan makes it possible to see the availability of reactive power reserves [3].

AUDIT PHASE

COMPLIANCE AUDIT 2011

There is a dedicated display on the SCADA system with all available capacitors and reactors. In the planning phase n-1 disconnection of reactors/capacitors is simulated. When commissioning a new element (cable etc.) ad hoc reactive power studies are conducted.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered sufficient explanation.

Improvement/Mitigation plan with deadline:
n/a

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4.20 P3-B-S2.1.2 COORDINATION FOR VOLTAGE AND REACTIVE POWER MANAGEMENT

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-B-S2.1.2.

Coordination for voltage and reactive power management. A coordinationbetween adjacent TSOs is needed in order to manage voltagecontrol (primary and other means) and reactive power resources nearboundary preventing that individual actions have a contrary effect to thesecurity of neighbors (including border nodes for voltage) in normaloperation and in case of disturbances.

Compliance Level: FC

transpower
FC

Additional Questions

Do you have any reactive power resources which are placed near to the boundaries of your system?

transpower
yes

Do you inform your neighbours in advance if you intend to perform an action that will cause significant increase or decrease of voltage at your boundary substations?

transpower
yes

Do you inform your neighbours if a disturbance which occured in your system causes a significant change of voltage at boundary substations and additional reactive flows on tie-lines?

transpower
yes

How do you control voltages and reactive power flows on tie-lines (i.e. using of reactors or capacitors, generator based reactive power dispatch, etc.)?

transpower
Reactors and generators

AUDIT QUESTIONNAIRE 2011

P3-B-S2.1.2 COORDINATION FOR VOLTAGE AND REACTIVE POWER MANAGEMENT. A coordination between adjacent TSOs is needed in order to manage voltage control (primary and other means) and reactive power resources near boundary preventing that individual actions have a contrary effect to the security of neighbors (including border nodes for voltage) in normal operation and in case of disturbances.

Overall Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Neighbour	Compliance level
TenneT	FC

Concise explanation for declared compliance level:

If there is a reactive power surplus or deficit we contact TenneT in order to solve the problem. TenneT also contacts us if there is a problem especially with a surplus of reactive power. If TenneT expects a surplus of reactive power they tell us what they intend to do (disconnection of lines). We can help them on the border with connecting reactors and down regulate reactive power on the Enstedværket generator.

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you inform your neighbours in advance if you intend to perform an action that will cause significant increase or decrease of voltage at your boundary substations?

Neighbour	Yes	No
TenneT	X	

List of evidences, comments:

Neighbours are informed by telephone.

Do you inform your neighbours if a disturbance which occurred in your system causes a significant change of voltage at boundary substations and additional reactive flows on tie-lines?

Neighbour	Yes	No
TenneT	X	

List of evidences, comments:

Neighbours are informed by telephone.

How do you control voltages and reactive power flows on tie-lines (i.e. using of reactors or capacitors, generator based reactive power dispatch, etc.)?

Neighbour	Explanation
TenneT	We control voltage on tie-lines by using reactors, capacitors and
	generators. It Is also possible to change the position of the tap-changer
	transformers near the boundary.

List of evidences, comments:

There are reactors in 150 kV station Kassø and in 400 kV station Landerupgård.

There are capacitors placed on 60 kV level in Magstrup and Bredebro.

There is a generator placed in Ensted.

The tap-changer on transformers can be changed in 220 kV station Ensted and Kassø and in 400 kV station Kassø.

Do you have any reactive power resources which are placed near to the boundaries of your system?

Neighbour	Explanation
TenneT	There are reactors, capacitors and generators near the border.

List of evidences, comments:

In 150 kV station Enstedværket there is a generator (-200/200 MVar)

In 150 kV station Kassø there is a reactor (170 MVar)

In 400 kV station Landerupgård there is a reactor (140 MVar)

In 60 kV station Bredebro and Magstrup there are capacitors (23 MVar og 10 MVar)

AUDIT PHASE

COMPLIANCE AUDIT 2011

As written above, if there is a reactive power surplus or deficit Energinet.dk contacts TenneT in order to solve the problem. TenneT also contacts Energinet.dk if there is a problem especially with a surplus of reactive power. If TenneT expects a surplus of reactive power it communicates what it intends to do (disconnection of lines). Energinet.dk can help on the border by connecting reactors and down regulating reactive power on the Enstedværket generator.

Side letter to the agreement with TenneT, chapter 3.4.9: “E.ON Netz and Energinet.dk pursue voltage and reactive power optimization in their 380 and 220 kV grids (...) parties have jointly determined the admissible voltage ranges, particularly in the boundary stations of their grids (...) where necessary, the contracting parties will jointly agree appropriate measures to return to the admissible voltage range”.

Compliance Level suggestion by the audit team:

FC

Explanation for the suggested compliance level:
Energinet.dk has delivered all necessary documents, evidences and explanations

Improvement/Mitigation plan with deadline:
n/a

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4.21 P3-D-S2 TRANSIENT ANGLE STABILITY CALCULATION

PREPARATORY PHASE

SELF-ASSESSMENT QUESTIONNAIRE 2010

P3-D-S2.
Transient angle Stability calculation. Each TSO has at its own disposal relevantdynamic models and dedicated software in order to carry out dynamic simulationsensuring transient angle stability in its responsibility area.
Compliance Level: FC
Additional Questions Do you have relevant dynamic models in order to carry out dynamic simulations ensuring transient angle stability in your responsibility area.

AUDIT QUESTIONNAIRE 2011

P3-D-S2 TRANSIENT ANGLE STABILITY CALCULATION. Each TSO has at its own disposal relevant dynamic models and dedicated software in order to carry out dynamic simulations ensuring transient angle stability in its responsibility area

Compliance level **FC** ☒ **SC** ☐ **NC** ☐

Concise explanation for declared compliance level:

The Danish power system is in the middle of a major transition towards a power system based on renewable energy. This leads to a lot of new investments in transmission infrastructure including new interconnections. A major challenge is that we have to be able to operate the power system without the support of conventional power stations. For all of these reasons, Energinet.dk is spending comparatively many resources on dynamic security assessments including transient angle stability. However, attention is primarily devoted to voltage stability issues due to the fact that this phenomenon is of higher importance in our system (7 HVDC poles, 5000 wind turbines, 700 embedded combined heat and power stations). The dynamic power system studies are performed in a commercially available program in which we have 9 years of experience. We have approx 10 power systems engineers working in the field of dynamic modelling and simulation. (In addition we have approx 5 engineers working on electromagnetic transient issues related to our ambitious cable action plan.)

Do you have an addendum to the standard? **Yes** ☐ **No** ☒

In case of an existing addendum; list of evidences for a mitigation plan, comments:

Do you have relevant dynamic models in order to carry out dynamic simulations ensuring transient angle stability in your responsibility area?

Yes ☒ No ☐

List of evidences, comments:

For all major regulating assets we have detailed dynamic models available based on their physical implementation (no generic models). It is a requirement in the grid code that dynamic models are delivered upon commissioning of new assets and after retrofitting. We do selected dynamic model validation based on field tests.

AUDIT PHASE

COMPLIANCE AUDIT 2011

The software “DIGSILENT” is used for calculations. In order to validate models. Energinet.dk performs on-site tests. A part of the models has been presented to the Audit Team.

Energinet.dk presents a study (for target year 2014) performed about possibilities to operate the eastern and western Danish power system with only one central power station in operation in each area.

Energinet.dk developed a complete dynamic model for the network. In case of a new element (generator, etc.) on site ad hoc tests are performed in order to validate the parameters.

Energinet.dk has a team dedicated to dynamic studies.

Compliance Level suggestion by the audit team:
FC

Explanation for the suggested compliance level:
Energinet.dk has delivered

Improvement/Mitigation plan with deadline:
n/a

5 CONCLUSIONS

Energinet.dk was open to provide all information and documentation required by the Audit Team. Energinet.dk did not request signing a supplementary confidentiality agreement to assure that the Audit Team members will maintain the confidentiality of the information obtained during the on-site compliance audit process.

Energinet.dk reported that it spent 300 working hours for preparing itself for the compliance audit.

The grid of Energinet.dk is divided into two parts: DK1 – the western part synchronous with the Region Continental Europe, and DK2 – the eastern part synchronous with the Region Nordic system. The compliance audit focused only on DK1.

According to decision of the SG CME Energinet.dk was treated as a control area in terms of Policies 1 and 2, although Energninet.dk is not officially recognized as such by the RG CE Plenary. On the basis of evidences provided during the Audit phase, all standards concerning Policies 1 and 2 were assessed as “fully compliant”.

The Audit Team found that standards from Policy 3 are the most critical. Upgrading/downgrading of the standards:

- The level of full compliance has been confirmed for 8 of the 12 standards belonging to the Policy 3
- In case of one standard (P3-A2-S1 “Determination of the external contingency list and observability area”) the level of sufficient compliance has been confirmed
- The standard P3-A2-S2 “Implementation of observability area” was upgraded from sufficiently compliant to fully compliant
- The standard P3-A1-S2 “Coordination for exceptional type of contingency” was downgraded from sufficiently compliant to non-compliant
- The standard P3-A3-S2 “Overloads in N-1 situation (simulation)” was downgraded from fully compliant to non-compliant
- As to standard P3-A4-S3 “Principle of No Cascading with Impact Outside my Border", the Audit Team acknowledged full compliance of Energinet.dk due to specific characteristics of its grid (connection to Continental Europe via a double circuit 400 kV line, and adequate protection setting on tie-lines preventing cascading effects)

Main recommendations from the Audit Team:

- For the two standards P3-A1-S2 and P3-A2-S1, there is a valid addendum. Moreover, cascading effects are avoided by adequate protection system on the tie-lines whose setting is commonly agreed with TenneT. However, the Audit Team proposed to Energinet.dk to perform a study to show whether there are exceptional contingencies in the Danish system which may impact the interconnection, and to share with TenneT Germany the results of the study. The deadline is July 2012, but the Audit Team propose to develop the analysis faster and to inform the Plenary that full compliance is reached.
- For the standard P3-A3-S2, Energinet.dk will prepare a list of remedial actions in order to standardize best practice and to improve the exchange of knowledge. Deadline: end of 2011.
- For the standard P3-A4-S4.1 “Regional agreement for the set of remedial actions” constraints impacting neighbouring areas (TenneT) can be avoided by limiting the transit between Denmark and Germany. However the Audit Team proposed to share with TenneT the threshold established by Energinet.dk, which must not to be surpassed for the tie-lines.

Additional information concerning the finalisation of the Compliance Audit Reports:

Within the scope of the compliance audit it was found that Energinet.dk is not compliant (NC) with the standard P3-A3-S2 “Overloads in N-1 situation (simulation)”. This finding was not objected by

Energinet.dk at the end of the audit. During the commenting phase of 4 weeks after the audit, Energinet.dk sent two additional evidences (Day-ahead instruction doc. no. 252214 and Day of operation instruction doc. no. 221786) claiming that these documents prove that Energinet.dk is sufficiently compliant (SC) with the standard P3-A3-S2.

The Audit Team acknowledges the additional documentation and understands it as a part of fulfilling the mitigation plan to this standard.

The instructions provide general recommendations to dispatchers for managing situations of temporary overloads in N-1 situations in the planning phase and in the day of operation and must be improved with specific (and not general) remedial actions for the most relevant constraints.

Additional recommendation: Energinet.dk procures the primary reserves assigned by ENTSO-E to the western part of Denmark DK1 (27 MW). The Energinet.dk staff inserts the reaction of the western part of the Danish system into the ENTSO-E “incident file” in case of bigger power plant outages (>1000 MW) within the synchronous system of Continental Europe. However, TenneT Germany doesn’t observe the Danish border in case of such outages, which means that it delivers the reactions of the sum of the TenneT and Danish system. This implies that the reaction of the Danish system is reported twice. On the other hand, the SG CME has the information that the primary reserve of the Danish system is comprised in Amprion’s files on procurement of German primary reserves (in the sense that the Danish primary reserve as of ±27 MW is procured directly in Germany, and not in Denmark). The Audit Team suggests that Energinet.dk clarify all this with the German TSOs, and also within the SG System Frequency (next meeting is on 07/10/2011).

After the audit, Energinet.dk has agreed with Amprion (SG SF meeting on 07/10/2011) that Energinet.dk will not comment incidents any longer. Amprion will do that on behalf of the complete German Control Block. If an incident happens in DK1, Energinet.dk will report this in the Incident Files.

After the SG SF meeting on 07/10/2011, Energinet.dk and Amprion investigated if the Danish primary reserve is procured "twice", and they found that this is not the case.

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6 SIGNATURE PAGE

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Date and Place: 31.10.2011, Brussels, Belgium

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