

DEP SPECIFICATION

REQUIREMENTS FOR REAL-TIME PRODUCTION OPERATIONS AND PRODUCTION-CRITICAL REAL-TIME DATA

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DESIGN AND ENGINEERING PRACTICE



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TABLE OF CONTENTS

1.	INTRODUCTION	4
1.1	SCOPE	4
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	6
1.3	DEFINITIONS	6
1.4	CROSS-REFERENCES	10
1.5	SUMMARY OF MAIN CHANGES.....	10
1.6	COMMENTS ON THIS DEP	11
1.7	DUAL UNITS.....	11
1.8	NON NORMATIVE TEXT (COMMENTARY).....	11
2.	REQUIREMENTS AND GUIDELINES FOR PRODUCTION RTO CAPABILITIES	12
2.1	BACKGROUND	12
2.2	SCOPE AND CONTEXT	12
2.3	REQUIREMENTS FOR SYSTEMS SUPPORTING RTO CAPABILITIES	12
2.4	REQUIREMENT FOR SUSTAINABLE RTO CAPABILITIES.....	22
3.	PRODUCTION CRITICAL REAL TIME DATA	23
3.1	BACKGROUND	23
3.2	SCOPE AND CONTEXT	24
3.3	RTO DATA CRITICALITY RANKING	24
4.	REFERENCES	28

APPENDICES

APPENDIX 1BASIC GENERIC DATA CHECKING	29
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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the setting up of the technology infrastructure to support Upstream Production Real Time Operations (RTO) and the acquisition and quality assurance of related real-time production data.

This DEP is intended for use by those involved in the designing, deploying, and upgrading systems for the support of Upstream Production RTO.

This DEP identifies generic functionality, standards and best practices, whilst allowing for differences in history, business requirements or local legislation that may require different implementations from one project to another.

This DEP provides:

- Specification of the key functionalities required and key supporting elements of the infrastructure to be put in place to support Real Time Operations.
- Together with Standard Form DEP 59.01.10.80-Gen. a minimum set of criticality-ranked real-time data crucial to executing key RTO processes.

The systems enabling the process data flow from the field to Process Control Domain, and thereafter, into the Office Domain for Production RTO may be divided into a number of distinct levels as follows (the Shell PCD Technical Reference Model):

- Level 0: Field Devices
- Level 1: Process Connected Sub Systems and I/O
- Level 2: Distributed Control System, Real Time Operations Human Interface
- Level 3: Process Control Network or Process Information Network
- Level 4: Desktop Networked Access, Office Domain, Usually Site Wide. This level includes Site Operations Management.
- Level 5: Internet, Global Communications

The proper functioning of the systems in Levels 0 to 4 is necessary for efficient and meaningful RTO workflows. However, this DEP focuses mainly on the requirements for the systems and functionality in Levels 3 and 4 as they relate to Production RTO.

The following is specifically EXCLUDED from the scope of this DEP:

- Level 3, 4 and 5 IT architecture requirements.
- Levels 1, 2 and 3 Process Control Domain IT architecture and security aspects (refer to DEP 32.01.20.12-Gen.).
- Levels 0, 1 and 2 in their entirety: The specific requirements for instrumentation and metering systems (refer to DEP 32.31.00.32-Gen.), field radio telemetry systems, instrumented protective functions (refer to DEP 32.80.10.10-Gen.), and the base layer production monitoring and control system, including control room equipment and operations (refer to DEP 32.30.20.15-Gen.) are excluded from the scope of this DEP.
- Level 3 base layer and advanced close loop set point control (refer to DEP 32.30.20.16-Gen.).

- Collaborative Work Environments (CWE). CWEs (or Production Operations Collaborative Centers (POCC) or Remote Control Rooms) allow multi-way audio-visual communication across multiple manned process control, production operations and production support locations, enabling staff from various disciplines and locations to collaborate more effectively. CWEs are critical for efficient RTO as they significantly improve human communications and operational coordination. However, CWEs are EXCLUDED from the scope of this DEP as there are separate internal Group guidelines for CWE design and implementation, see the Informative version of this DEP.
- Rotating equipment condition monitoring systems (refer to DEP 31.29.00.11-Gen.).
- Hydrocarbon Production Information System.
- [Integrated] Production System Modelling (IPSM), although updating of IPSM models with RTO data is included, as is the use of IPSM models for RTO purposes.

The scope of this DEP INCLUDES specifically functional requirements for the following systems supporting RTO in the Office Domain (OD), using high frequency data from the PCD:

- Systems for the visualization of the state of Production, in the forms of real time trends or daily summaries, possibly within operating envelopes.
- Systems for the storage, archiving and retrieval of a broad range of process data (the Data Services Layer and Process Data Historians).
- Systems for the acquisition and processing of production well test data and for the estimation of production flows (virtual meters).
- Systems for the monitoring of surface and subsea facilities and pipelines.
- Systems for the management and use of models required for RTO, including the computation of forecasts or optimized settings for manual or automated application on an on-demand or daily basis for implementation within the same day.
- Systems for the detection of events or exceptions, and their archiving and subsequent use for "Exception Based Surveillance".
- Systems for cascading process set point commands from the OD to the field (if applicable).

In the event of contradictions between DEP 32.80.10.10-Gen. and this DEP; the requirements of DEP 32.80.10.10-Gen shall take precedence. It is also not the intent of this DEP to specify or determine requirements for the basic wells and process facilities operability during start-up or normal operations, which will be part of the Wells and Process Engineering design.

Plant operational safety and environmental data, while being critical in their own right, are out of scope of this DEP.

Formal hydrocarbon production reporting requirements are based on the Hydrocarbon Production Information System, and are excluded from scope of this DEP.

All alarms requiring immediate remedial action by an operator are to be managed within the Process Control Domain, and are outside the scope of this DEP.

Condition Monitoring Systems are primarily the responsibility of asset preventive maintenance groups and outside the scope of this DEP.

This is a revision of the DEP of the same number dated February 2014; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use primarily in the design and operation of oil and gas production wells and facilities. Such facilities and operations are termed "assets" in this DEP. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases, the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorized to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

The word **may** indicates a permitted option.

1.3.2 Specific definitions

Term	Definition
Alarm	The notification type used to notify operators of the exceedance of a Critical Limit or Standard Limit. Refer to DEP 32.80.10.14-Gen. for related definitions.
Alert	The notification type used to notify operators and/or operations support personnel of the exceedance of a target limit or other event that is not a Critical or Standard Limit. Refer to DEP 32.80.10.14-Gen. for related definitions.
Critical Limit or Standard Limit	Critical Limit: The value at which the operator has a last opportunity to diagnose a situation and respond in order to correct the process and prevent the consequences in a timely manner. Standard Limit: The limit, when exceeded for longer than the allowable time in exceedance, where sustained or recurring short-term operations will begin to cause cumulative degradation of equipment integrity or reliability, or other cumulative effects that could lead to reduction of production.
The Shell PCD Technical Reference Model	The Shell PCD Technical Reference Model is set out in DEP 32.01.20.12-Gen., Appendix 1. The model divides the process data acquisition architecture into a number of distinct levels as follows: • Level 5: The public Internet, Global Communications • Level 4: The Shell GI Office Domain Network. • Level 3: Process Control Network or Process Information Network, Optimizing Control. • Level 2: Includes functions involved in monitoring and controlling the physical process. Distributed Control System, Real Time Operations Human Interface / Primary Operator Interface. • Level 1: Process Connected Sub Systems and I/O. Continuous Controllers. • Level 0: Field Devices
Office Domain (OD)	The Office Domain (OD) includes all devices, nodes, systems and networks required to provide a standardised enterprise-wide Information Technology environment, hence Levels 4 and 5 in the standard model. The Shell Office Domain is standardised on GI and this DEP assumes that GI is fully implemented.
P&ID	Piping and Instrumentation Diagram (equivalent to PEFS)
PEFS	Process Engineering Flow Sheet
Process Control Access Domain (PCAD)	A Secure Cell consists of a Process Control Access Domain (PCAD) and one or more enclosed Process Control Domains (PCD). The Secure Cell ensures that Process Control Domains can work independently of the rest of the IT infrastructure (Office Domain).

Term	Definition
Process Control Domain (PCD)	Process Control Domain (PCD) covers Levels 1, 2 and 3 above, and has high level of security and availability, and a defined integrity level. Most PCD applications and systems are in direct communications with, and in control of, the production facilities.
Production Critical Data	Production critical data and documents are those which, when of good quality (accurate, consistent, accessible, available on time), can be used in key business processes at Levels 3 to 5 to improve the overall value derived from an asset, and when of poor quality (inaccurate, inconsistent, inaccessible or unavailable on time) may adversely affect the performance of the business processes.
Process Data Historian	System for the storage, archiving and retrieval of a broad range of process data.
Production Enterprise Architecture	The Production Enterprise Architecture provides the Information Technology (IT) / Information Management (IM) framework to allow efficient delivery of information to support Production Engineering workflows. This architecture defines RTO IT requirements for Levels 4 and 5 of the General Process Management and Control System Model. Several platform / service layers are defined, including: 1. Data Sources 2. Application Components 3. Integration Platform comprising Application Services and Data Services 4. Presentation Services
Production Real Time Operations (RTO)	The purpose of Production Real Time Operations is to enable 'just-in-time' local/remote monitoring and collaboration, optimisation and control of product flows within the Integrated Production System operating envelope. RTO refers to activities related to the management of oil and gas production based on real time data and with actions to be taken in the hours to days-time frame.

1.3.3 Abbreviations

Term	Definition
DCAF	Discipline Controls and Assurance Framework
PEFS	Process Engineering Flow Scheme
DCS	Distributed Control System. Also referred to as BPCS (Basic Process Control System)
KPI	Key Performance Indicator
P&ID	Process and Instrumentation Diagram (see PEFS)
SCADA	Supervisory Control and Data Acquisition
ERP	Enterprise Resource Planning
DACA	Data Acquisition And Control Architecture
CWE	Collaborative Work Environment
DQ	Data Quality
EBS	Exception Based Surveillance
ESP	Electric Submersible Pump
IPM	Integrated Production Modelling - a suite of modelling tools
IPSM	Integrated Production System Model
PCP	Progressive Cavity Pump
PI	Plant Information, an application by OSIsoft
POCC	Production Operations Collaborative Centres
PSO	Production System Optimisation
QC	Quality Control/Check
SAP	The Primary Shell ERP System
SOP	Standard Operating Procedure
WRFM	Wells, Reservoir and Facilities Management
IT	Information Technology
EDW	Engineering Data Warehouse