TOTAL
COMMITTED TO BETTER ENERGY

OFFSHORE & ONSHORE RELIABILITY DATA (OREDA) COLLECTION – SNAPSHOTS FROM AN OREDA JIP MEMBER COMPANY

- Development of an internal data collection process in Total E&P -

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Field Operations

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Development of an internal data collection process in Total E&P

1. OREDA JIP IN FEW POINTS

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- JIP established in 1983.
- Main objective: Build and maintain a high quality reliability database on offshore, onshore and subsea equipment used in oil and gas E&P.
- All data collection activities fully in line with ISO 14224.

  Note: The first version of this International Standard has been issued more or less starting from the OREDA Data Collection guidelines.
- Current members: Eni, BP, Petrobras, Gassco, Engie, Statoil, Shell and Total.
- Current Project Manager: DNV GL.
- Equipment population in the OREDA computerized database = About 18,000 topside units (Offshore and Onshore) and about 2,500 subsea units.
- 2 steering committee meetings per year.
- 3 Work Groups (WG): Subsea, Method and Downstream (2 meetings/WG/year).

2. TOTAL'S DIFFICULTIES WITH REGARD TO OREDA IN 2014

Context in 2014:

Total's commitment to OREDA for the Data Collection Phase 12 period (i.e. from 2015 to 2017):

- Provide our own data set for Phase 12;
- Reimburse Statoil in terms of reliability data for Phase 12 - Statoil provided a data set for us for Phase XI (agreement Total - Statoil - OREDA JIP).

If one of these objectives is not met, Total will have to leave the JIP and will have no more access to both Phase 11 and Phase 12 data.

Objective defined by Total's managers:

Develop and implement within 2 years an internal data collection process in order to build a data set equivalent to a minimum of 6 years of commitment in terms of data delivery to OREDA that would allow Total to stay in the JIP.

2. TOTAL'S DIFFICULTIES WITH REGARD TO OREDA IN 2014

Why staying in the OREDA JIP?

- OREDA = Main reliability data source for SIL/HIPS studies and Production Availability Studies (PAS): large equipment population, database built with experts of other Majors, diversity, work started more than 30 years ago, database fully in line with the international standard ISO 14224, etc.
- Access to the computerized database.
- Possibility of using the OREDA Data collection and Data analysis software to manage our own reliability database.
- Benchmarking between our reliability data and the entire database.
- Multiple exchanges with reliability experts of other major petroleum Companies (reporting, data management strategy, Reliability/Production availability studies...).
- Other users in Total:
  - Maintenance teams to...
    - *"Get the failure rate, reliability, unavailability, etc. of certain type of eq. (for reference purpose);*
    - *Comparison between equipment design and model => Consideration for equipment selection;*
    - *To know the type of failure => Decide emphasize of improvement."*
  - HSE for Risk analyses;
  - Subsea engineers for comparisons between failure frequencies...;
  - HSE and Maintenance teams in our subsidiaries.

3. SELECTED SRATEGY

Main principles:

- Focus our efforts on a small number of equipment types in order to limit the number of interlocutors.
- Select equipment types considered as “high value-added” by the JIP according to the value model defined at the beginning of each data collection phase.
- Use as far as possible existing reporting tools.
- Work with subsidiaries that are best in class in terms of maintenance operations, monitoring and reporting.
- Clearly identify all the stakeholders and request them to commit to a roadmap previously approved by our managers.

3. SELECTED SRATEGY

Selected equipment:

Topside:

Objects : 36 turbo-machines
- 14 gas turbine driven centrifugal compressors;
- 22 gas turbine driven alternators;
- 36 gas turbines.

Observation period : 4 years on average

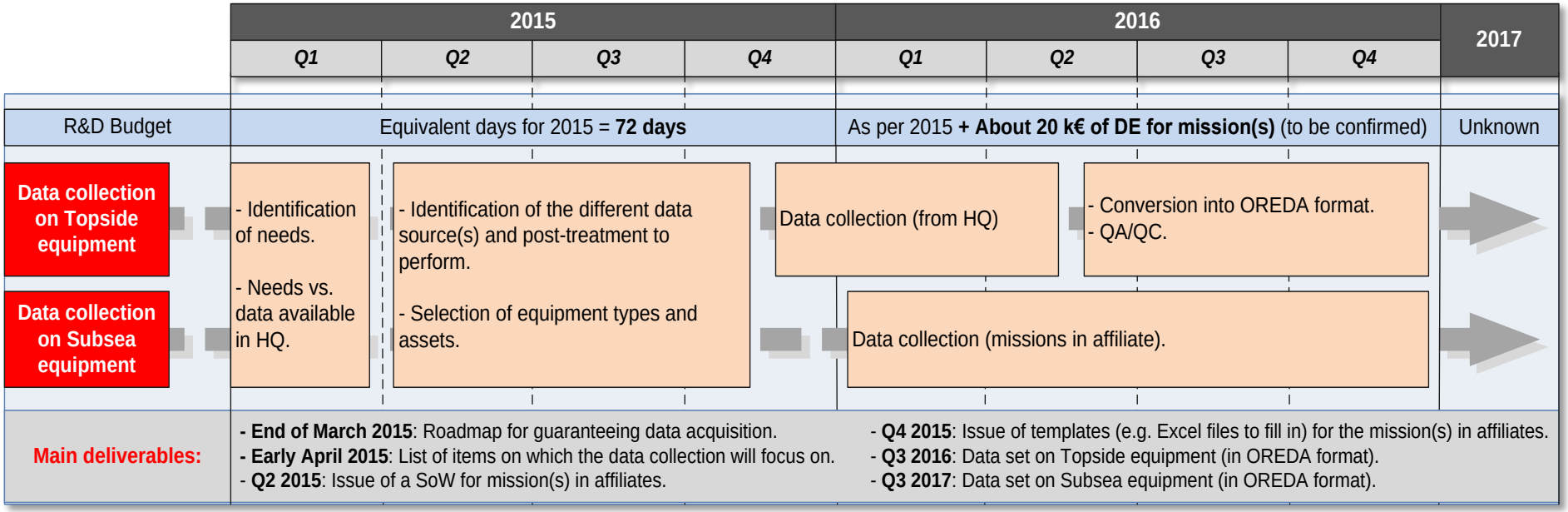
Subsea:

Objects : about 100 X-mas trees

Observation period : 4 years on average

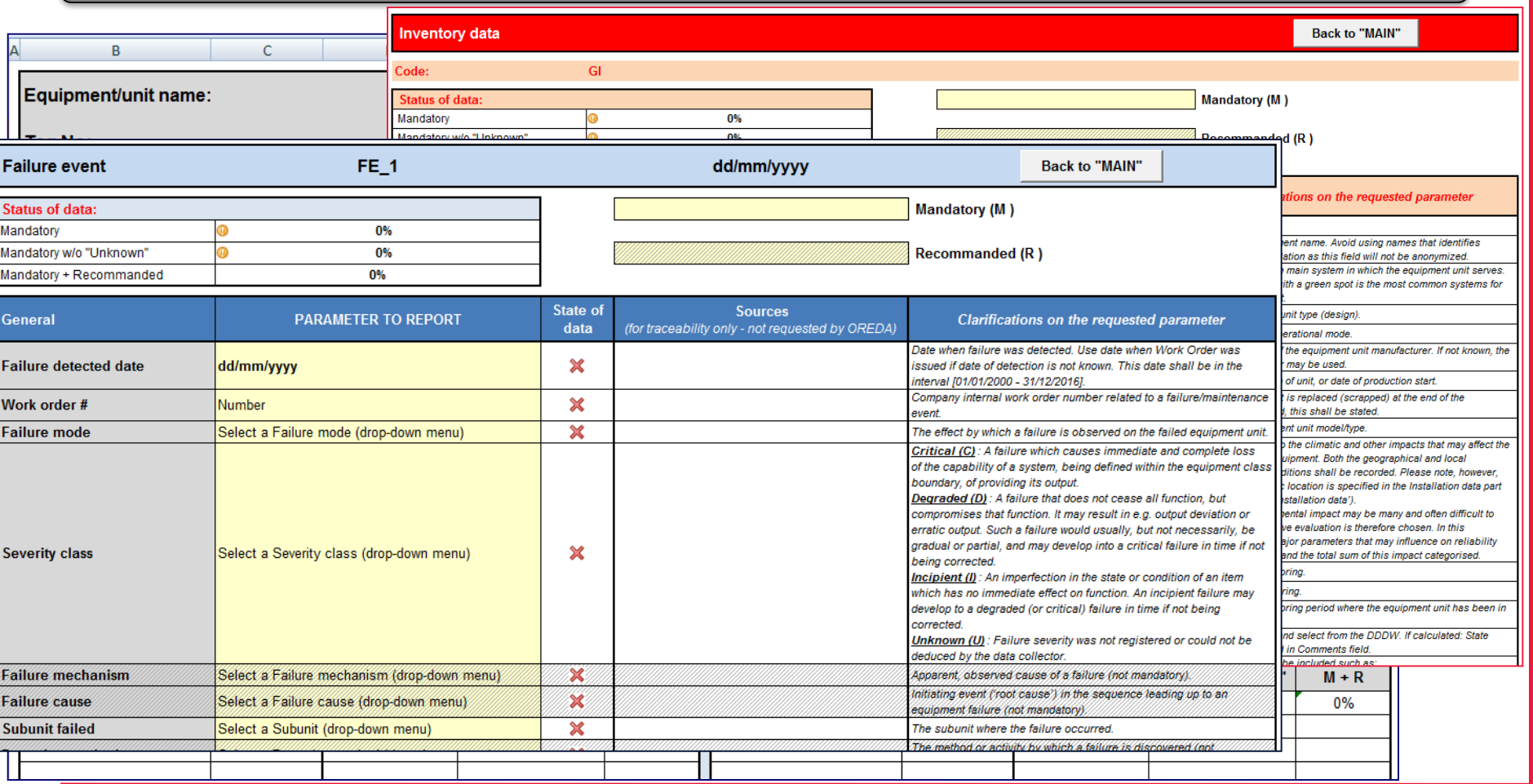
3. SELECTED SRATEGY

Reliability data acquisition for internal use and for OREDA JIP: ROADMAP



3. SELECTED SRATEGY

Excel templates for data acquisition (1 file to fill in per item):



Inventory data

Back to "MAIN"

Code: GI

Status of data:		
Mandatory		0%
Mandatory w/o "Unknown"		0%
Mandatory + Recommanded		0%

Mandatory (M)

Recommanded (R)

Equipment/unit name:

Failure event FE_1 dd/mm/yyyy Back to "MAIN"

General	PARAMETER TO REPORT	State of data	Sources (for traceability only - not requested by OREDA)	Clarifications on the requested parameter
Failure detected date	dd/mm/yyyy	✖		Date when failure was detected. Use date when Work Order was issued if date of detection is not known. This date shall be in the interval [01/01/2000 - 31/12/2016].
Work order #	Number	✖		Company internal work order number related to a failure/maintenance event.
Failure mode	Select a Failure mode (drop-down menu)	✖		The effect by which a failure is observed on the failed equipment unit.
Severity class	Select a Severity class (drop-down menu)	✖		**Critical (C)** : A failure which causes immediate and complete loss of the capability of a system, being defined within the equipment class boundary, of providing its output. **Degraded (D)** : A failure that does not cease all function, but compromises that function. It may result in e.g. output deviation or erratic output. Such a failure would usually, but not necessarily, be gradual or partial, and may develop into a critical failure in time if not being corrected. **Incipient (I)** : An imperfection in the state or condition of an item which has no immediate effect on function. An incipient failure may develop to a degraded (or critical) failure in time if not being corrected. **Unknown (U)** : Failure severity was not registered or could not be deduced by the data collector.
Failure mechanism	Select a Failure mechanism (drop-down menu)	✖		Apparent, observed cause of a failure (not mandatory).
Failure cause	Select a Failure cause (drop-down menu)	✖		Initiating event ('root cause') in the sequence leading up to an equipment failure (not mandatory).
Subunit failed	Select a Subunit (drop-down menu)	✖		The subunit where the failure occurred.
				The method or activity by which a failure is discovered (not

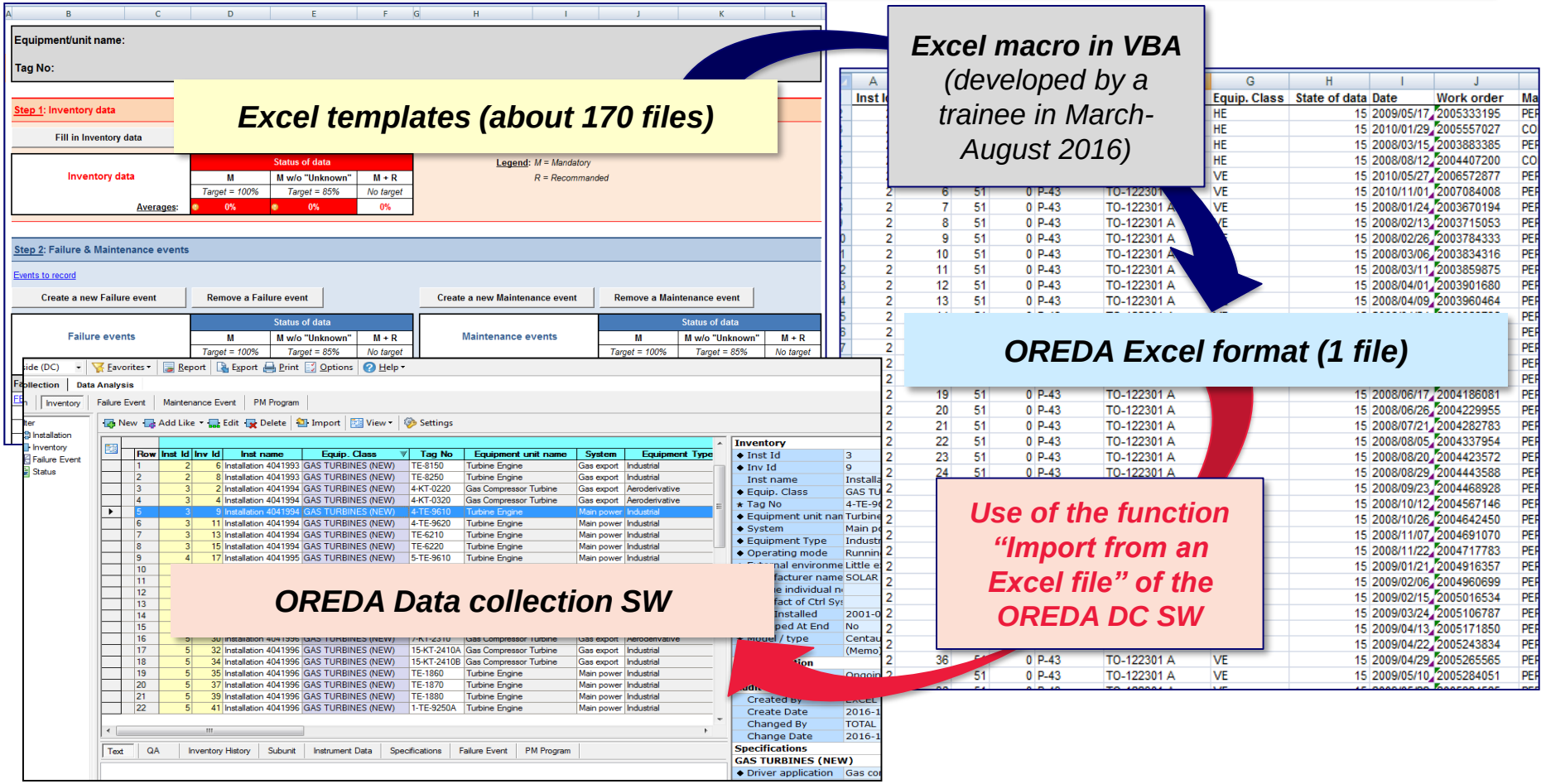
Clarifications on the requested parameter

M + R

0%

3. SELECTED SRATEGY

Conversion into OREDA format:



4. CONCLUSIONS AND PERSPECTIVES

- Size of the data set collected equivalent to 12 years of commitment in terms of data delivery to OREDA.
- ISO 14224 requirements regarding inventory data are difficult to fulfil, especially for subsea equipment for which there are many parameters to collect.
- ISO 14224 requirements regarding failure events are also quite difficult to fulfil as an analysis is necessary for each event, even for incipient and degraded failures.
- The strategy “Excel templates + Conversion via VBA” is suitable/efficient for a small number of equipment types but not for a long term solution that would have to focus on all equipment types.
- This data collection performed in Total E&P over the last 2 years is a 1st step of a long term solution for the continuous development of an internal reliability database.