CEER TSO Cost Efficiency Benchmark

Gas asset reporting guide

Final version

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1. Introduction

1. The CEER benchmarking projects for electricity and gas Transmission System Operators (TSOs) use two data calls to collect the required data:
    1. the financial data call, and
    2. the asset data call.

2. For both calls TSOs report their data in a separate reporting template (Excel) based on separate reporting guides which are meant to explain how the templates have to be filled in. The current guide deals with the gas asset call and goes with its associated asset reporting template. Basically the asset reporting presents a snapshot of the asset base at a specific date set by project management.

3. Note that this guide (and its associated reporting template) is essentially a further development of the asset reporting guide used in the previous CEER gas TSO cost efficiency benchmark E2gas (2015-2016).

4. Please fill in all fields of the financial reporting template. To avoid misunderstandings, always fill in an explicit “0” or “N/A” if that is the case.

5. This guide is structured as follows. Chapter 2 of this guide describes the different asset categories that need to be reported. Chapter 3 provides general reporting directions. Chapter 4 contains specific instructions per asset category and for some performance indicators.

2. Network components (asset categories)

6. To describe the network (grid) several components (asset categories) that can be distinguished. In the reporting template there is a sheet for each asset category.

Pipes

7. This refers to the pipeline network transporting natural gas from the injection points to delivery points.

8. Three types of pipes are distinguished:
    1. Onshore (overland) pipes that are primarily laid on land.
    2. Offshore (subsea) pipes. Such pipes are laid in open sea, generally on the seabed or in a trench across the seabed.
    3. Inshore water crossings, being pipes located in the vicinity of the coast or in coastal areas and that are primarily laid on the bottom of inshore waters or trenched below it (connecting for example the land to islands near the coast, crossing sea channels or river deltas). Generally these pipes are of modest (but still substantial) length, compared to offshore pipes. These pipes are therefore not considered as offshore pipes nor as onshore pipes. In addition, inshore water crossings should be distinguished from major lake crossings or river crossings, which are rather “obstructions” to onshore pipes.

Regulators

9. The pressure regulators are installations serving to reduce the gas flow or pressure in the system. Such assets are located between points with a different nominal pressure or at a connection point where pressure is changed (e.g. in a gas delivery station where pressure is reduced).

Compressors

10. Compressor stations are installed along the pipeline route in order to compensate pressure drops as the network develops. A compressor station may have several compressor units.

Connection points

11. Connection points are physical entry and exit points where gas enters or leaves the network. A connection point can also be a regulator or a compressor.

Metering stations

12. This asset category refers to metering stations with equipment for measuring which can be “stand-alone” or be a part of regulators, compressors or

connection points. The asset category metering stations only refers to “stand-alone” meters.

Control centers

13. A control center (sometimes called dispatching center) is a strategic infrastructure for around-the-clock managing and controlling gas flows on the transmission network to ensure safe, reliable, efficient and uninterupted operations as well as network balancing based on the actual gas demand. ICT (hard- and software) used in a control center is an integral part of it. This also includes grid related telecommunications (telecommunications solely related to the network). This comprises of transmission of electronic information for metering, control and supervision of the network with means other than through third-party operators. This also includes SCADA and optical fibers and other infrastructure that is used for telecommunication.

3. General reporting directions

Reporting scope

14. In the reporting template only the natural gas assets are reported, although the source of such gas flowing through the grid may vary between natural gas fields, LNG terminals, storage facilities, or biogas plants.

15. Assets are reported as they appear at a specific moment ("snapshot") defined by project management, see Article 2.

16. Assets upstream from injection points and downstream from delivery points are not reported, nor is any equipment reported required to control for the gas quality (like quality conversion or odorization facilities). In particular storage or production plants (including LNG or biogas) are out of scope of the current reporting.

17. Offshore assets are excluded from reporting. Offshore assets comprise:
    1. Offshore transmission networks (i.e. subsea pipelines that for a dominant part lie on the seabed or are trenched below it, used to transport gas from a production platform to a connection point onshore) and
    2. Subsea interconnectors (i.e. subsea pipelines between two connection points from different countries that for a dominant part lie on the seabed or are trenched below it, used to transport gas from one country to another, e.g. the gas interconnector from Scotland to Ireland).

18. Unless otherwise requested, the assets reported should relate to
    1. The reporting TSO's own assets that have not been decommissioned (i.e. those assets that are permanently not in use anymore by the TSO, no matter if these are removed or not) and that are partly or fully operated by the reporting TSO to fulfil its own supply obligations.
    2. Network components not owned by the reporting TSO, but leased, rented or otherwise made available (fully or partly) to the reporting TSO by third parties and used by the reporting TSO to fulfil its own supply obligations. For sake of asset reporting such components are considered as assets of the reporting TSO.

19. Assets which are owned by the reporting TSO, but not used by the reporting TSO to fulfil its own supply obligations because the assets are fully leased, rented or made available otherwise by the reporting TSO to third parties should be attributed to these third parties and should not be reported here.

20. With reference to Article 18, in case the asset is only used partly by the reporting TSO, the share of usage must be reported. This share is based on

capacities granted on a contractual basis and not on property or ownership shares. So, the reporting TSO has the asset to its free disposal for that part, regardless of the actual utilization. In such cases the name(s) of the parties with which the sharing is done will also be reported.

21. Regarding the reporting of measured gas flows (average flows, peak flows, sum of flows, etc.), when several TSOs use the same pipeline(s) to inject to or deliver from their networks, for each TSO only the portion of the flow to or from its own network counts for that TSO and not the combined measured flow for all TSOs that use the pipeline(s).

Asset properties

22. Any asset reported must be given a unique ID, unless stated otherwise.

23. The Maximum Operating Pressure (MOP; Upstream or Downstream, if applicable) refers to the maximum pressure (bara) at which a pipe can be operated continuously under normal conditions. Should the pipe be slightly damaged, but still operable, then the MOP should be reported as the maximum pressure in safe operation

24. For the purpose of the reporting with “normal condtions” in general we mean the conditions the asset was designed for.

Gas properties

25. All values should be provided to normal temperature and pressure (bara; T = 0°C, P = 1.01325 bar).

26. Regarding the distinction between H- and L-gas (high and low calorific gas), in practice, average HHV (Higher Heating Value) of L-Gas is lower than, or equal to 10.5 kWh/m^3(n), while average HHV of H-Gas is higher than 10.5 kWh/m^3(n).

Commissioning, acquisition, and rehabilitation

27. The commissioning year of an asset is the year when the asset was put in operation (for the first time), irrespective of this was done by the TSO or a third party.

28. In case the asset has been obtained from a third party, in addition to the commissioning year, the acquisition year (year of investment, or at least the major part of it) also needs to be provided.

29. By default the commissioning year is equal to the acquisition year (in the template indicated as “N/A”).

30. In case the asset has been significantly rehabilitated the rehabilitation year also needs to be provided. Significant rehabilitation means a large incremental investment into an existing asset without change of any characteristics (i.e. its dimensions and properties). Large is defined as at least 25% of the (real) initial investment. Regular preventive and reactive maintenance, e.g. replacement of system components at or before their lifetime is not counted as a “rehabilitation”. Investments changing the characteristics are considered as “upgrades” and not as rehabilitation. The default reporting is “N/A”, i.e. there is no significant rehabilitation.

Generic data to be provided (per asset)

31. For each asset, the following information is asked for in the reporting template:

32. ID: See Article 22.

33. Gas type: H-gas or L-gas, see Article 26.

34. Usage share: A percentage, see Article 20. In case of full usage by the reporting TSO (default), 100% is filled in explicitly.

35. Third parties: These are the names of the parties the sharing is done with, see Article 20. By default “N/A” is reported to signal that no sharing is done (Usage share is 100%).

36. Commissioning year: See Articles 27 to 30.

37. Acquisition year: See Articles 27 to 30.

38. Rehabilitation year: See Articles 27 to 30.

39. Please refer to Chapter 4 for the required specific information per asset.

4. Specific reporting directions

40. Below, we introduce the data to be provided specifically for each asset.

Pipes (Sheet "1. Pipes")

41. Please report all onshore pipes and inshore water crossings, but not offshore pipes.

42. Length: Length (km) of the pipe (measured without end user connections).

43. Volume: Inner spatial volume V_i (m^3) of the pipe, to be calculated based on length L_i and inner diameter $D_{inner,i}$. Spatial volume is therefore independent of the pressure level and calculates as follows:

$$V_i = \pi \cdot \left(\frac{D_{inner,\,i}}{2}\right)^2 \cdot L_i$$

To compute $D_{inner,i}$, use the average wall thicknesses of the pipe.

44. Inshore water crossing: This indicates if (Yes/No) the pipe (a) is an inshore water crossing (cf. Article 8) that (b) is submerged at a depth of more than two meters below the water surface for at least 1,000 meters and for at least 75% of its length. Yes means that both condition (a) and (b) are true. A pipe that fulfils (a) but not (b) is regarded as an onshore pipe. In fact condition (b) explicits the term "primarily" in Article 8 sub 3.

45. Water crossed: In case the pipe classifies as an inshore water crossing (Inshore water crossing = Yes), state the name of the water crossed (otherwise fill in N/A). This is the name as it is known to the public.

46. MOP: Maximum pressure (bara) at which the pipe can be operated continuously under normal conditions. See also Article 23.

47. Material class: Steel pipes are protected against external corrosion by an external coating and a cathodic protection system, alternatively through the use of other materials. In case the pipe has more than one coating type, the dominant one (measured in length) will be reported here. Reporting options are:

S1	Steel pipeline with PE (Polyethylene), PP (Polypropylene) or FBE (Fusion bounded epoxy) and cathodic corrosion protection.
S2	Steel pipeline with PE, PP or FBE and no cathodic corrosion protection.
S3	Steel pipeline bituminous-treated and cathodic corrosion protection.

S4	Steel pipeline bituminous-treated and no cathodic corrosion protection.
I	Cast iron pipeline.
PE	Polyethylene pipeline.
PVC	PVC pipeline.
FRC	Fibre reinforced composite pipeline.

48. Diameter: Diameter of the pipe in mm. Provide the exact value of the outside pipe diameter in mm (e.g. 609.6 mm instead of ND 600 for a 24" pipe).

Regulator stations (Sheet "2. Regulators")

49. Upstream MOP: Maximum pressure (bara) at which the upstream pipe can be operated continuously under normal conditions. See also Article 23.

50. Downstream MOP: Maximum pressure (bara) at which the downstream pipe can be operated continuously under normal conditions. See also Article 23.

51. Flow rate: Hourly nominal output (m^3(n)/h).

52. Metering: The regulator may be equipped with metering equipment to measure the transported gas. If so, indicate the type of metering (Turbine, Orifice, Ultrasonic, Other). If not, indicate "N/A". Metering equipment to measure the energy used to operate the compressor itself should not be reported here.

Compressor stations (Sheet "3. Compressors")

53. Upstream MOP: Maximum pressure (bara) at which the upstream pipe can be operated continuously under normal conditions. See also Article 23.

54. Downstream MOP: Maximum pressure (bara) at which the downstream pipe can be operated continuously under normal conditions. See also Article 23.

55. Overall efficiency: Overall efficiency (%) for the compression ratio determined by Upstream MOP and Downstream MOP. Overall efficiency means the global efficiency of compressor units including internal adiabatic (or polytropic) efficiency and mechanical efficiency. In gas compression, isentropic efficiency can be considered as equivalent in first approximation to adiabatic efficiency.

$$\eta_{ad\ global} = \eta_{ad\ internal} \cdot \eta_{mechanical}$$

This is the efficiency used to calculate the power required on the machine shaft.

56. Minimum inlet pressure: Technical minimum inlet pressure (bara) at which the equipment can be operated continuously under normal conditions.

57. Flow rate: Hourly nominal output (m^3(n)/h).

58. Type: Select type of compressor unit:
    1. Centrifugal compressors driven by gas turbines.
    2. Centrifugal compressors driven by electric motors.
    3. Reciprocating compressors driven by gas engines (integrated compressor / gas engine included).
    4. Reciprocating compressors driven by electric motors.
    5. Other.

59. Power: Provide installed power (kW) of the compressor unit.

60. Metering: The compressor may be equipped with metering equipment to measure the transported gas. If so, indicate the type of metering (Turbine, Orifice, Ultrasonic, Other). If not, indicate "N/A". Metering equipment to measure the energy used to operate the compressor itself should not be reported here.

Connection points (Sheet "4. Connection points")

61. A connection point can be of more than one type (injection, delivery) simultaneously and/or also for H-gas and L-gas simultaneously. In such cases report these functionalities as distinct connection points (i.e. use separate lines in the reporting template), with the same ID to flag that the asset is actually the same. For example, if a connection point is both injected from another network and also delivers to another network, for both H- and L-gas, then four items are reported for this connection point, all reported with the same ID, but with their own functionalities.

62. Function: Injection or Delivery.

63. Type: The following types of connection points are distinguished:

I_N	Injection from another network.
I_P	Injection from a production plant (including LNG regasification facilities and biogas plants).
I_S	Injection from storage.
D_D	Delivery to downstream network.
D_C	Delivery to large customers (direct withdrawal).
D_S	Delivery to storage.
D_N	Delivery to neighbouring networks.

64. Regulator/compressor: If the connection point is also a pressure regulator or a compressor, select the corresponding ID from sheet 2 (Regulators) or sheet 3 (Compressors) to flag the relation. If this is not the case, fill in “N/A” (which is the default).

65. Delivery station: In case the connection point has a delivery station (it is of type D_*), there can be two situations. Either the delivery station is not an integrated part of the TSO’s network, i.e. the connection point lies directly behind a safety valve (Not integrated), or the delivery station is an integrated part of the TSO’s network, i.e. the connection point lies behind the delivery station (Integrated). If the connection point is an injection point (types I_*), fill in N/A.

66. MOP: Maximum pressure (bara) at which the pipe to which the connection point is connected can be operated continuously under normal conditions. See also Article 23.

67. Min pressure: For delivery type of connection points this is the minimal pressure (bara) that has to be reached technically or contractually. The highest value applies. For injection type of connection points this is the minimal pressure (bara) that has to be reached technically or that the upstream party is allowed to set. Again, apply is the higher value.

68. Max pressure: For delivery type of connection points this is the maximum pressure (bara) that can be reached technically or contractually. The highest value applies. For injection type of connection points this is the maximum pressure (bara) that can be reached technically or that the upstream party is allowed to set. Again, apply the higher value.

69. Injection peak: This is the highest measured hourly concurrent sum of injections (m^3(n)) of all physical upstream injections at this connection point that has occurred during the year meant in Article 2.

70. Delivery peak: This is the highest measured hourly concurrent sum of deliveries (withdrawals) (m^3(n)) to all physical downstream deliveries from this connection point that has occurred during the year meant in Article 2.

Metering stations (Sheet “5. Metering”)

71. Metering stations that are also connection points should not be reported separately, as it is assumed that such connection points have a metering functionality. If metering equipment is part of a regulator or compressor, the metering equipment is considered to be an attribute of the regulator or compressor (and indicated as such on the sheets for reporting regulators and

compressors). So, here only metering stations that function “stand-alone”, i.e. outside connection points, regulators or compressors, are reported.

72. MOP: Maximum pressure (bara) at which the pipe for which the measuring is done can be operated continuously under normal conditions. See also Article 23.

Control centers (Sheet “6. Control centers”)

73. For control centers the following is reported:

74. Gas type: In deviation from Article 33, if both H-gas and L-gas apply, fill in Both.

75. Name: Name of the control center.

76. Functions: A description of the main functions and characteristics of the control center.

77. Staffing: The control center is an operational unit that is staffed during normal operations (Yes) or an emergency (reserve or back-up) center that is fully equipped but not normally staffed (No).

Performance indicators (Sheet “7. Indicators”)

78. In this sheet several (actually measured) performance indicators are reported for a period of several years. Per indicator this is done separately for H-gas and L-gas.

79. Line pack: Natural gas (m^3(n)) contained at the end of the year in the network.

80. Energy injected: This is the annual sum of energy (in m^3(n) and kWh) injected into the reported gas grid.

81. Energy delivered: This is the annual sum of energy delivered / withdrawn (in m^3(n) and kWh) from the reported gas grid. To be included are also clients with individually negotiated terms. Energy delivered is reported broken down as follows:
    1. Energy delivered to DSOs.
    2. Energy delivered to final customers (including industrial customers).
    3. Energy delivered to domestic TSOs.
    4. Energy delivered to foreign TSOs.
    5. Energy delivered to storage.
    6. Self consumption.
    7. Network losses.

82. Injection peak: This is the highest sum of loads (m^3(n) and kWh) of simultaneous (concurrent) injections into the reported gas grid (measured as hourly values) on any hour during the year.

83. Delivery peak: This is the highest sum of loads (m^3(n) and kWh) of simultaneous (concurrent) deliveries by (withdrawals from) the reported gas grid (measured as hourly values) on any hour during the year.