EPOS WP 5 – Cross-sectorial validation

Lead: VEOLIA

Simulated IS potential study per cross-sector II

D5.3

Veolia

July, 2019

Summary

The EPOS project aims at developing the EPOS toolbox. The EPOS toolbox aims to support Industrial Symbiosis (IS) identification and optimisation for cross-sectorial energy and resources integration. The aim of WP5 - within the EPOS project - is both to ensure the replicability of the methods and tools developed within the EPOS project, as well as to assess the replicability (generalisation potential) of the solutions identified using this EPOS toolbox. WP5 tasks aim to define which realistic industrial conditions lead to IS success. These actions build on findings from all previous WPs, including the industrial cluster analysis (WP1), development of sector blueprints (WP2), the development of the EPOS tool (WP3) and its application to a demo case - the Dunkirk case (WP4), and namely on the work carried out using integration into EPOS toolbox the blueprints.

To assess the replicability, that is the generalisation potential, of specific synergies identified by the EPOS toolbox, replicability assessment protocols were defined to monitor the application of the EPOS toolbox to the EPOS clusters for IS identification through either a single or multi-objective optimisation approach. This deliverable describes the rationale for these tests and summarises their results.

Three replicability tests were defined by Veolia, reviewed with all EPOS partners, and in particular EPOS industry partners, that applied the tests to their respective cluster simulations:

- **Test 1: Replicability of blueprints within a sector** to compare site data (measured data) with simulated data defined using the blueprints: for each cluster, the industrial user measures given KPIs using selected site data; then the respective sector blueprint is used for estimating similar KPIs. "A blueprint can be considered generic or replicable within a given sector if specific KPI values determined from measured data and blueprints are similar".
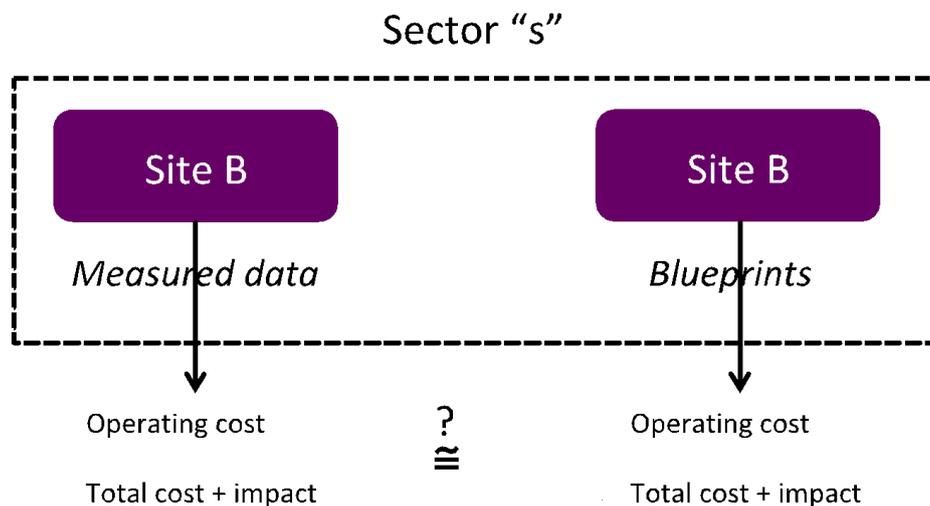
Sector "s"

Site B

Site B

Measured data

Blueprints

Operating cost

?
≅

Operating cost

Total cost + impact

Total cost + impact

Figure 1: Schematic representation of Test 1

As an example, selected KPIs (operating cost, production volume, electricity consumption, gas consumption) simulated using the mineral sector blueprint were compared with reference data from real mineral production sites. The same type of approach was used for all four process sectors, as well as for the district heating network blueprint. The five blueprints were validated.

- **Test 2: Generalisation of results within a given sector** to analyse the sensitivity of a solution identified to parameter variation between sites within a given sector. This test aims to assess the influence of a different scale for instance (or another variable parameter) between two sites of the same sector, and to determine whether a solution valid for one is still applicable to the other: "A solution can be considered generic or replicable within a given sector if repeating the same analysis leads to similar results even on a different scale, for the same sector".
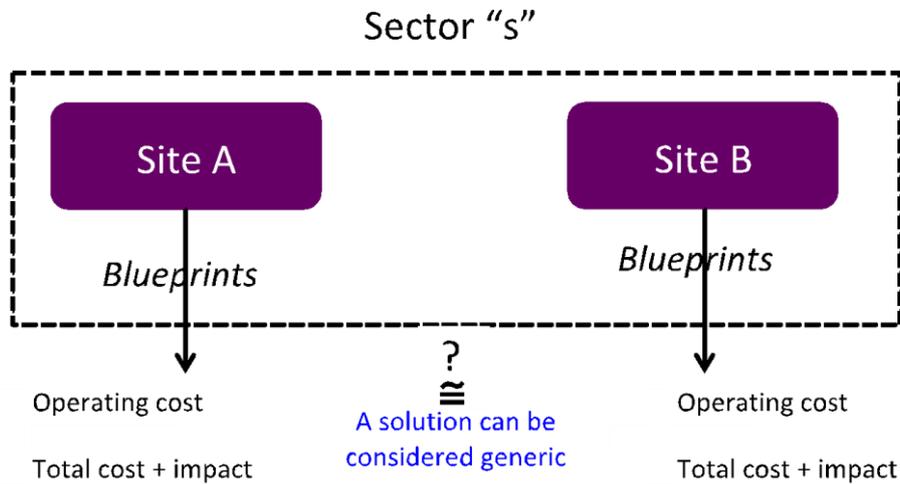
Sector "s"

Figure 2: Schematic representation of Test 2.

Test 2 was passed for the sectors Minerals, Chemicals, Cement and Steel. For each sector, multiple tests were run with a wide range of synergies / solutions.

- **Test 3: Generalisation of results for two "matching" sectors:** This test is meant to be a sensitivity analysis on the match-making potential between sites of two different sectors. The test is meant to assess whether a symbiosis solution identified from the perspective of sector S1 suggesting a potential synergy with sector S2 will still hold to be relevant from the perspective of sector S2. This test will also enable the assessment of whether a synergy identified for a specific sector-sector pair can be generalisable to other sites of these two sectors, and hence will enable the assessment of the representativeness of blueprints as effective predictors of two sector's match-making potential, in general.
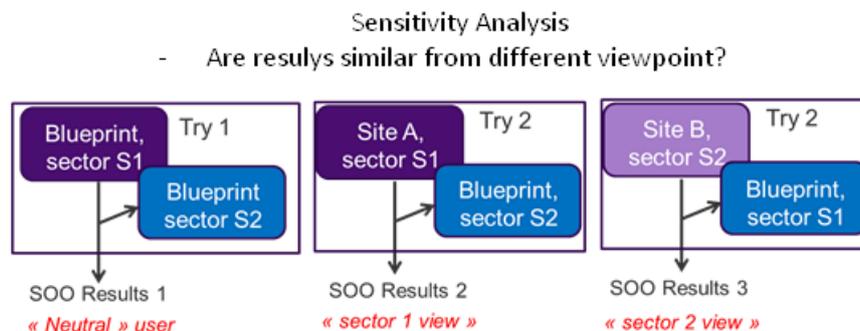

Figure 3: Schematic representation of Test 3.

For example, for the steel sector, potential synergies were identified using (a) the blueprints of the two sectors (steel and chemicals, steel and minerals), then (b) steel site data versus the refinery or minerals blueprint. The results show that the replicability can be validated:

- For refinery, the coke exchange and the COG exchange were found in both tests. Furthermore, similar KPIs were obtained in the two tests, thus confirming the replicability of the toolbox regarding the match between steel and petrochemicals;
- For minerals, the marble, chalk, limestone and dolomite exchanges were detected also for both tests. The KPIs obtained confirm the replicability of the toolbox regarding the match between steel and minerals.

Conclusions

The three different replicability tests were conducted on all sectors using the computational back-engine of the EPOS toolbox as a result of pending issues - at that stage - with regards to the EPOS toolbox interface – using both modelled data (blueprints) and measured/acquired data (site data). To sum up the overall results, tests 1 and 2 were conclusive for all 4 sectors, whereas test 3 was conclusive for all sectors but cement (for which the blueprint had not yet been successfully implement in the tool at that stage).