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PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	X

Scope

Extending the standard static process integration analysis and total site analysis as described in deliverable D5.2 new methods and tools as developed within the EFENIS project have been applied to the demo site 2 for further improvement. The following additional aspects beyond the scope of the conventional total site methodology should be covered by a fundamentally improved total site analysis. The various additional aspects considered in the improved methodology can be divided into methods for the optimization of individual units and for the optimization on total site

level. This has been implemented in a sequential workflow starting with the identification of energy savings and integration potentials on unit level followed by methodologies dealing with the total site.

Additional aspects to be considered for the optimization of process integration inside battery limits of individual production units:

- Process design improvements for energy consumption reduction,
- Conceptual design modifications for optimized heat integration,
- CHP (Combined Heat & Power) integration within unit battery limits,
- Dynamic behaviour of the individual units.

Additional aspects to be considered for the optimization of process integration on total site level:

- Determination of steam and power targets based on new methodology as described in deliverable D1.1,
- Optimized conceptual design of site utility systems & infrastructure,
- Dynamic behaviour of site utility systems,
- Incorporation of operability (of individual units as well as site utility systems),
- RAM (Reliability, Availability, Maintainability) analysis,
- Waste heat recovery.

Fundamentally improved Total Site Analysis

The application of new methods and tools as developed within the EFENIS project showed some differences in the steam and power targets of the total site. These were compiled in the following table template.

	Conventional methodology			Improved methodology		
Steam main	Generation / [MW]	Usage / [MW]	Power / [MW]	Generation / [MW]	Usage / [MW]	Power / [MW]

Level 1 units' cluster

To evaluate new utility systems, the level 1 units were clustered to resemble one big plant. From this approach the generation potential and the demand for new utility systems was derived and tabled as in the following template.

Utility	Generation potential / [MW]	Demand / [MW]

Detailed planning of identified improvement measures

Identified improvement measures were elaborated further and their savings and economic viabilities were compiled and shown as in the next table template.

Saved energy / [MW]	Savings potential / [PJ PE/a] & [kt CO2/a]	Rating	Payback time / [a]

Comparison of standard total site analysis and fundamentally improved method

A comparison of the potential savings of projects identified with the conventional and the fundamentally improved methodology completed the deliverable:

Methodology	Savings PE / [PJ/a]	Savings CO2 / [kt/a]	Rating		
			Category	Category	Category