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RE	Restricted to a group specified by the consortium (including the Commission Services)	**X**
CO	Confidential, only for members of the consortium (including the Commission Services)	

Summary

This report provides account of the recent advances towards the integration of process design, process control and process operability in the framework of the current project. Two topics are covered in this report

- Improving operability of site utility systems, subject to demand fluctuation
- Total Site Process Operability for Energy Efficiency

There are two parts of the reported tool package. Both parts of this deliverable analyse the transient behaviour of the site energy systems in the two parts of the operability domain. The steady-state analysis provides the control objecives for either keeping the systems at the set operating points or transfer the system operation from one operating point to another. A key degree of freedom suggested is to use effiiciently energy storage. The dynamic analysis then provides the means of achieving the set control objectives. Put together, the two procedures can be used to devise operating strategies for maximising the efficiency and minimising the carbon emissions of the Total Site energy systems, aiding in the fulfillment of one of the objectives of this project.

First is an updated procedure for energy targeting for total sites under considerable variations of energy demand and supply. Here the transient behaviour is analysed from the viewpoint of the overall varying energy balances and setting the objectives for the control system.

The second part presents a new *mixed integer dynamic optimization algorithms* and is based on a simultaneous strategy featuring high fidelity process dynamic models, conventional PI control schemes, explicit consideration of structural process and control design aspects (such as number of trays, pairing of manipulated and controlled variables) through the introduction of 0-1 variables, and explicit consideration of time-varying disturbances and time-invariant uncertainties. This methodology analyses and caters for the site energy systems transient behaviour from the viewpoint of designing the optimal control systems for fulfilling the control objectives. The application of this strategy to a typical distillation system is also discussed.