SUSTAINABLE ENERGY AUTHORITY OF IRELAND

LIEN CASE STUDY

GILEAD

Data Collection Case Study – Steam Generation Metrics

This project was completed as part of a LIEN Energy Data Management Special Working Group initiative in conjunction with Energy Analytics

Gilead Sciences are a research-based biopharmaceutical company focused on the discovery and development of medicines to transform and simplify care for people with life threatening diseases. Gilead Sciences, Carrigtwohill, Co. Cork are responsible for manufacturing, quality control, packaging, and the release and distribution of the company's products in the European Union and other international locations. The objective of this case study was to identify the key data requirements to facilitate the development of effective EnPI's for the steam generation system. This work underpinned the site goal of achieving a 42% reduction in CO_2 onsite and achieving net zero carbon emissions by 2030.

Background

Steam under pressure has the ability to carry, and then give up, large amounts of energy. Boiler houses are the heart of an efficient steam plant. The objectives of the boiler are to release energy in the fuel as efficiently as possible, transfer the released energy to the water and to generate steam as efficiently as possible.

Project Aim

There is a dearth of data available in the majority of boiler-houses to generate effective EnPIs. The data that is available, is often either collected manually in maintenance logs or check sheets, or is monitored via local read outs from which the data is not harvested for further analysis. The objective of this project was to create a robust data collection and analysis pipeline from previously unanalysed significant energy users using as much available infrastructure as possible. By standardising the data availability assessment and working with key people within the company during the project, it is hoped that the method utilised during this project will become standardised for future data gathering initiatives onsite.

Figure 1: Gilead Steam Generation Boiler

Method

A digitalisation strategy approach was taken to determine and implement effective monitoring of the EnPI's for Gilead's steam generation system in a structured, well-defined and repeatable manner. The aim of the digitalisation strategy was to aid the rationalisation of the required meters to monitor the steam generation system's EnPIs. Digitalisation of these EnPI's would enable the facilities team to manage, trend and visualise consumption from the steam generation systems and validate any savings made. The seven-step digitalisation process seen in the figure below guided this project.

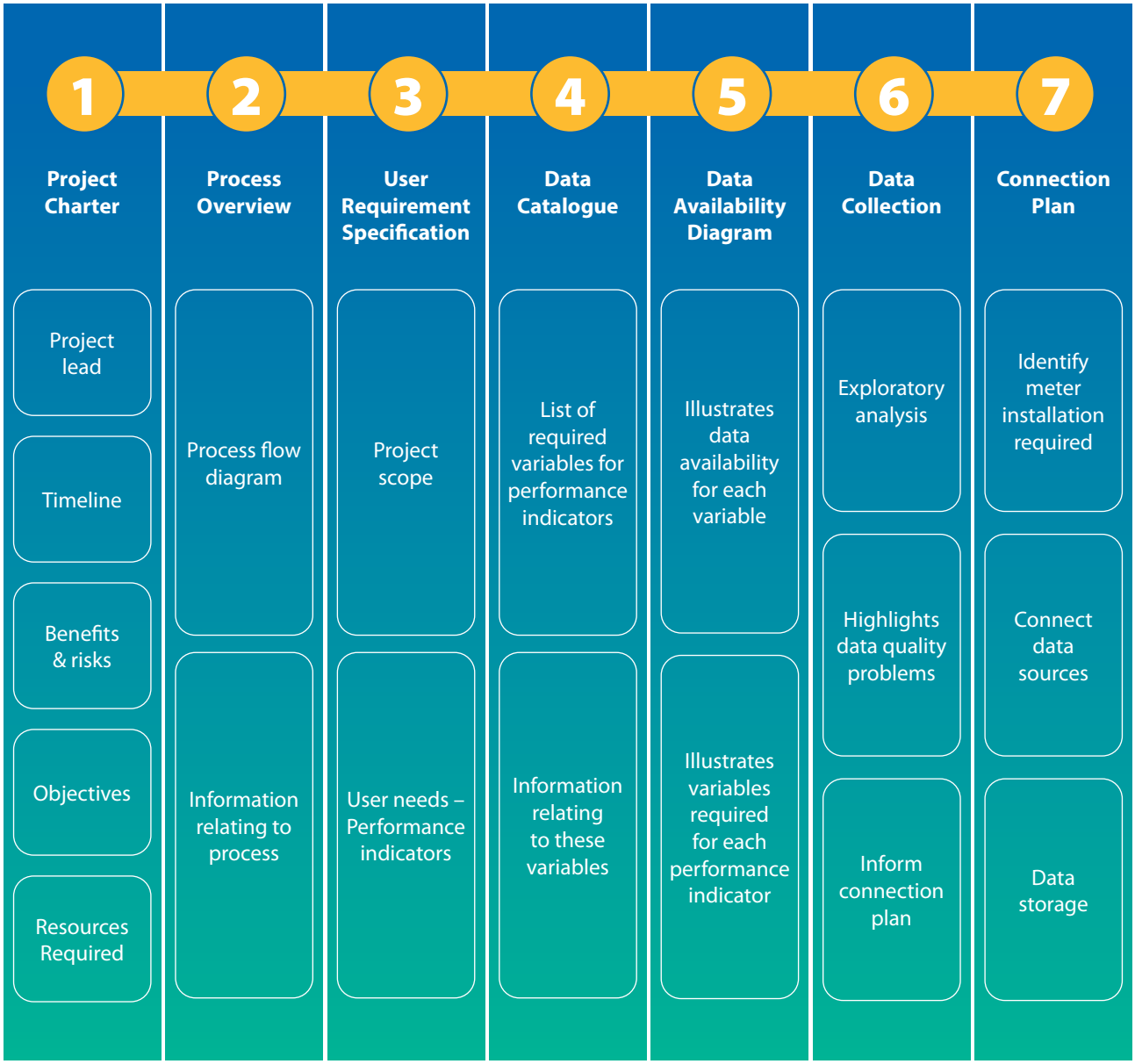

Figure 2: Seven-Step Digitalisation Process

1 Project Charter

Firstly, the Project Charter was documented by undertaking a short workshop with key personnel in Gilead. This outlined the title of the project, the project sponsor, key stakeholders, the project lead, project objectives, timeline, benefits, risks, current state and future state. At this stage, the project objectives were identified as follows:

- Identify Energy Performance Indicators (EnPI) for the steam generation system
- Improve energy monitoring
- Monitor and trend equipment efficiency
- Assist in fault finding and corrective actions required to resolve any non-conformance with EnPIs

2 Process Overview

The second step was to get an overview of the process and identify data that is currently monitored and sources that aren't monitored and could be digitalised. A walk down of the steam generation system was conducted to familiarise the project team members with the system. This involved visually inspecting local data collecting systems, and conducting operational checks on local sensors.

3 User Requirement Specification

The third step in the process was to create a User Requirement Specification (URS). This Involved documenting the intended audience, what was in and out of scope for the project, the user requirements, assumptions and constraints. The user requirements were defined as follows:

- Monitor boiler efficiency %
- Monitor condensate recovery %

The URS is a crucial step in the digitalisation process, as it identifies the performance indicators to be monitored. Following this, the variables that are required to enable the monitoring of these performance indicators can be determined.

4 Data Catalogue

The fourth step is a Data Catalogue which can be documented after determining the performance indicators. The Data Catalogue is a document that contains detailed information relating to the data required for the EnPIs. The data catalogue was documented containing each data point to be collected, the collection frequency, descriptions and units of measurement. For example, to calculate the first EnPI, boiler efficiency (Equation 1), data of heat exported by the steam and data of heat provided by the fuel are required.

$$\text{Boiler efficiency \%} = \frac{\text{Heat exported in steam}}{\text{Heat provided by the fuel}} \text{X100}$$

Equation 1: Boiler efficiency EnPI

5 Data Availability Diagram

The fifth step of the digitalisation process is a Data Availability Diagram to visualise and colour code the variables that were previously monitored and which needed to be newly acquired (digitalised) for each EnPI. The Data Availability Diagrams seen in Figure 3 and Figure 4 below were created for each EnPI for the steam generation system.

KEY

- General area to be monitored
- EnPI
- Data not currently available
- Data currently available

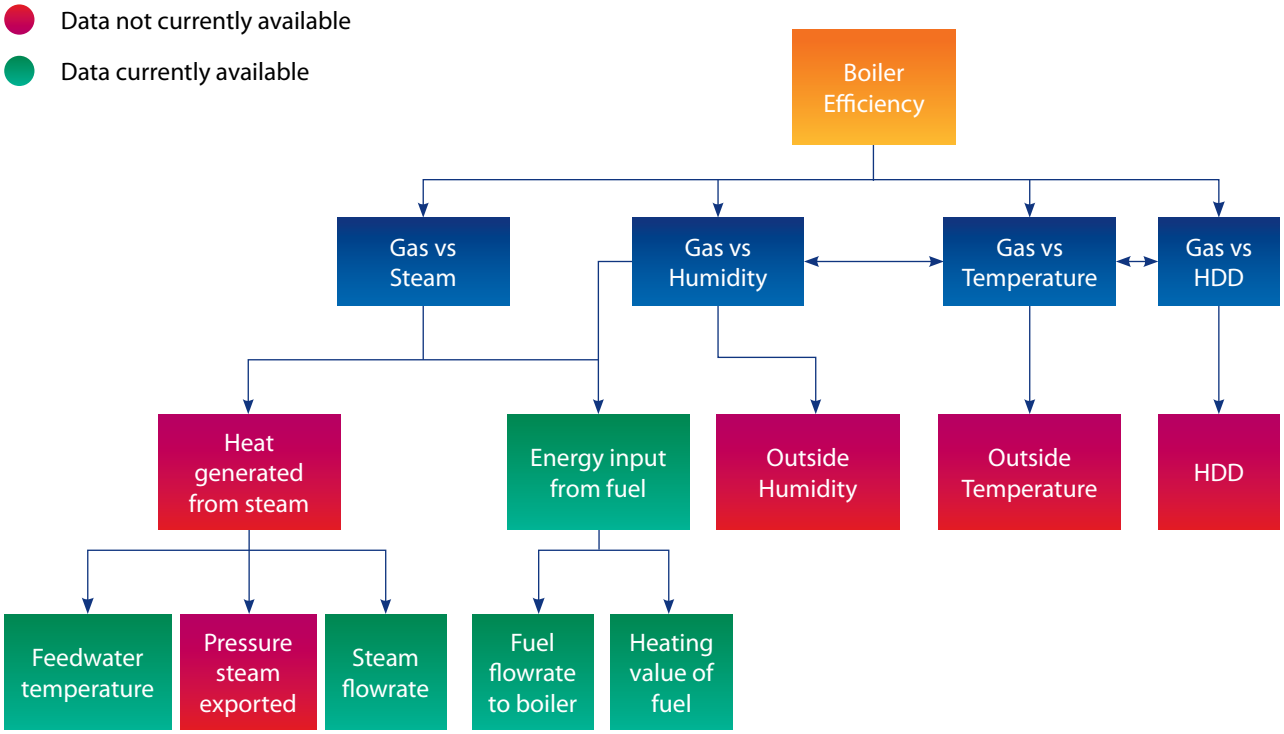

Figure 3: Data availability diagram – Boiler efficiency

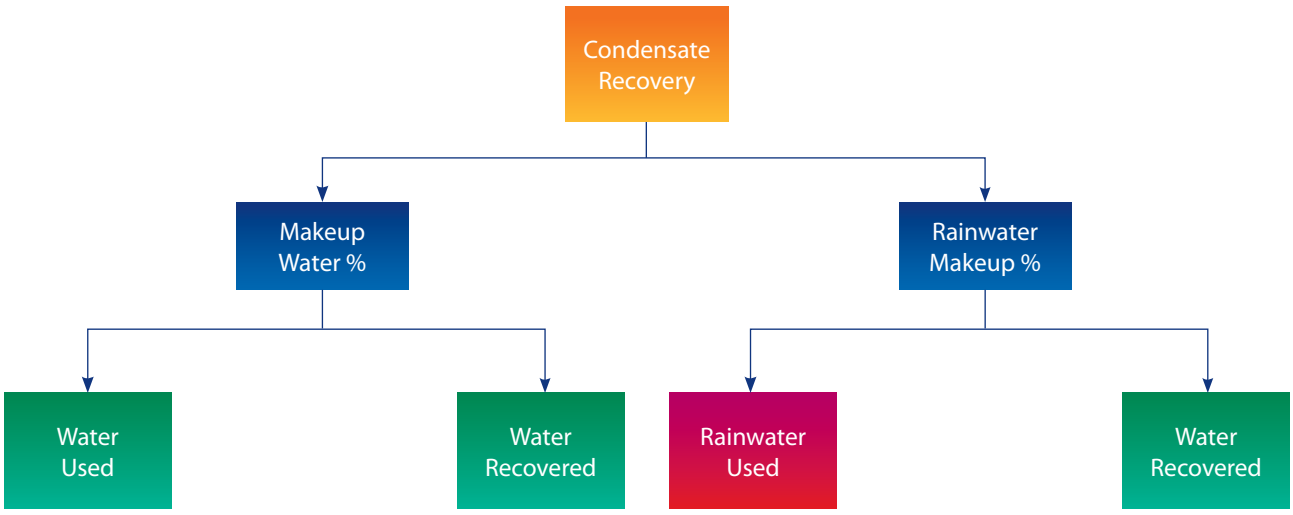

Figure 4: Data availability diagram – Condensate recovery

6 Data Collection

Step 6 of the digitalisation process was the collection of data (where available) for the variables identified in the Data Catalogue. The collected data can then be analysed to highlight any hidden data quality issues (errors, duplicates, missing values etc). This stage was particularly useful for Gilead's project as it highlighted that only 10% of their meters were reading correctly.

7 Connection Plan

The final step in the digitalisation process was determining the Connection Plan. This involved identifying the correct meter types, conversion factors, meter details, configuration of meters in the PLC, and correct vendor support. Access to meters, damaged meters and inaccurate meters were just some of the technical difficulties in this project.

A detailed meter commissioning spreadsheet was generated containing the list of meters which have been successfully configured and were reading correctly and the remaining meters to be configured. The vendor has installed a new PLC and standardised the output and conversion factors from each meter. The data now feeds directly to the EnMS and a visualisation platform for monitoring and management.

Conclusion

The purpose of the case study was to determine the EnPI's to monitor and manage gas consumption for their steam generation system. As a result of following the seven-step digitalisation strategy, Gilead have successfully identified EnPI's for their steam generation system and developed a detailed metering plan in compliance with ISO50001. Before the project, only 10% of the meters that were in this area were reading correctly in some cases without the knowledge of site personnel. After completing the 7-step digitalisation strategy, 80% of the meters are now reading correctly and an action plan is in place to configure the remaining 20%.

Benefits

The ability to monitor and manage the steam generation system provides the opportunity to review the entire system, identify opportunities and provide data to support energy audits. It also provides the timely ability to accurately report to senior management. It also empowers the energy team to make data-driven decisions, map real-time data against predictions, continuously monitor key performance indicators and investigate deviations from expectations.

Results & Key Achievements

- Identified EnPI's for steam generation system
- Effective metering of steam generation system increased from 10% to 80% with a plan in place to achieve 100% monitoring

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About Large Industry Energy Network (LIEN)

The Large Industry Energy Network (LIEN) is a network of ~200 large companies who the SEAI support in improving their energy performance and reducing emissions. LIEN is free to join and open to companies with an annual energy spend of €1 million or more. Companies must be certified to or committed to pursuing ISO 50001 certification.

The benefits of LIEN Membership include:

Expert Advice – Relationship Managers provide advice, mentoring, review projects – 5 days of consultation per year provided to each member company.

Training – LIEN calendar of training and technology focussed events throughout the year both online and in-person, the annual calendar is set through members feedback on relevant areas of interest.

Special Working Groups (SWGs) – Become part of a SWG such as Sectorial Decarbonisation or Energy Data Management to collaborate with members, learn from different companies experiences and work together towards common goals.

Savings/Reductions – LIEN member companies are all working towards energy savings and emissions reductions with the common goal of achieving the industry 2030 target of reducing direct emissions by 35%.

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