REPORT

D5.3 Report on certification support for 2nd industry project:

Waste heat recovery through a high temperature heat pump to support the heating demand of a printing plant

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Description of players

**Project owner:** Mediaprint Zeitungs- und Zeitschriftenverlag Gesellschaft m.b.H. & Co KG

The pilot project is planned at Mediaprint Zeitungs- und Zeitschriftenverlag Gesellschaft m.b.H. & Co KG (“MediaPrint”), Austria’s largest printing company with almost 1,400 employees. The MediaPrint printing centers produce a wide range of daily and weekly newspapers, monthly magazines and advertising materials.

**Project developer:** Denkstatt & Enertec GmbH

Denkstatt & Enertec GmbH („Denkstatt-Enertec“) is a Vienna-based consultancy active in the fields of energy management and energy efficiency and specialised in energy analysis, conceptualisation of individual energy solutions (including technical implementation), realisation of energy concepts, and energy optimisation.

Christian Schützenhofer and Sonja Siegl who worked on the particular pilot project are both registered in the Austrian “Register of Qualified Energy Service Providers”. Registration is based on specific educational and professional requirements in accordance with §17 of the Austrian Energy Efficiency Act, which is reviewed by the Austrian Energy Agency.

**In-country advocate:** Denkstatt GmbH

Denkstatt GmbH (“Denkstatt”) is a leading sustainability consultancy in Central and Eastern Europe and headquartered in Vienna. The company is an advisor on natural, social, human and financial capital and the Austrian partner in the Investor Confidence Project (ICP) Europe project consortium.

**Quality assurance assessor:** Verco

Verco is a sustainability and climate change consultancy, based in the UK, with 27 years of experience with focus on low carbon growth, energy efficiency and clean energy development, including experience of developing finance programmes. Its two main roles on ICP Europe are to provide EU-wide technical support, and to provide in-country advocacy for the project in the UK. Its technical role includes leading the development of the protocols and supporting tools, supporting the delivery of training to ICP credentialed Project Developers and Quality Assurance Providers, and providing Quality Assurance to projects seeking the Investor Ready Energy Efficiency certification.
Description of project
Description of the ECM

The pilot project is planned at one of the biggest Austrian printing centers of MediaPrint in Vienna and uses the ICP Europe Complex Industry Protocol. At this printing center, 10-14 million newspapers are printed each week. The energy conservation measure (ECM) would use the waste heat of the printing process to support the general heating demand by means of a high temperature heat pump, thereby reducing natural gas demand.

IPMVP option C “Whole facility” was chosen for the project. Option C was selected because energy savings were 11% of total energy consumption. For both the natural gas savings and the (relatively small) increase in electricity consumption due to the planned ECM the energy consumption data of the facility (using the main building utility meters) was chosen as baseline.
Steps taken for certification support

Overview of the process

The following chart shows the general ICP process for project development, quality assurance and project certification – as applied in this pilot project:

Project identification, MoU and kick-off

At the beginning of March 2018, Austrian ICP partner Denkstatt approached its daughter joint venture Denkstatt-Enertec about the opportunities for industrial pilot projects as well as the ICP framework, the ICP Complex Industry Protocols and the IPMVP standard in particular. Based on positive feedback from Denkstatt-Enertec, in the following weeks the requirements of ICP were discussed in detail and possible pilot projects were identified.

After discussions between Denkstatt-Enertec and project owners, two project owners agreed to have ICP applied to their industrial projects. On 26 March 2018, an MoU between Denkstatt and...
Denkstatt-Enertec was signed to develop these two industrial pilot projects, with the following recommended action plan:

- Development of two industry projects by Denkstatt-Enertec according to the ICP Complex Industry Protocol and preparation of documentation (with the communication support of Denkstatt, in particular on language/translation issues) for reviews and certification through ICP Technical Team / Quality Assurance Assessor
- Technical Support (i.e. PD training, reviews of documentation incl. gap analysis, certification) on IREE Projects through ICP Technical Team / Quality Assurance Assessor
- Participation in free ICP Industry Training and application to ICP Project Developer Network
- Registration for ICP Technical Forum and Ally Network
- Participation in two remaining Austrian ICP Steering Committee meetings and presentation of project results in one of those meetings

Based on project progress, it was later decided that the MediaPrint project would become the second of the stated two industrials projects to be developed and certified.

Training and PD Network Registration

On 27 April 2018, Denkstatt-Enertec took part in the ICP Online Training Webinar on the ICP Industry Protocols and then submitted the documentation required to join the ICP Project Developer Network for Industry. On 15 May 2018, Denkstatt-Enertec became the first project developer to join the ICP Project Developer Network for Industry.

In all, it took Denkstatt-Enertec around 2.25 days to do the ICP project developer training, study the requirements of the ICP framework and the respective Complex Industry Protocol, submit the required documentation, and join the ICP project developer network for industry. Throughout this process, Denkstatt as the Austrian in-country advocate acted as a point of first contact for Denkstatt-Enertec and provided support on questions on documentation, such as required qualifications, declaration of honour, etc., in coordination with the ICP Technical Team.

Verco reviewed Denkstatt-Enertec’s application to join the ICP Project Developer Network for Industry and Energy Supply, which is a pre-requisite for project certification. This involved reviewing the academic and professional qualifications and experience of the applicant, the Declaration of Honour, and the company’s professional insurance. Denkstatt-Enertec had also attended a training session on the application of the protocols, which was delivered by RdA and Verco.

Application of ICP

In the second half of May 2018, Denkstatt acted as an intermediary between Denkstatt-Enertec and Verco to communicate who would be responsible for the quality assurance
process at Verco, to connect the respective people, to provide a general overview of the project, and to establish an initial timeline for the project.

Based on an initial project description, including the nature of the proposed ECMs and the availability of sub-metering data, Verco and Denkstatt-Enertec agreed that the ICP Complex Industry Protocol was the most appropriate protocol for the project. Denkstatt-Enertec started to work on the tasks and documentation required by this Protocol.

This Protocol follows the usual ICP five stage process:

![ICP Protocol Diagram]

**Developing the project and preparing the documentation according to the ICP Protocol**

**Baselining**

Denkstatt-Enertec followed the tasks and documentation requirements of the ICP Complex Industry Protocol for the Baselining phase:

- Define the measurement boundary
- Establish the baseline period (at least one full energy-use cycle)
- Calendarise the independent variable data
- Establish the energy-use characteristics of equipment/system
- Collect data (Historical energy use, Production data, Weather data, Other independent variable data, Operational/Performance data, Facility asset information)
- Develop energy balances
- Develop the baseline energy consumption model (regression)
- if applicable: Establish peak demand and pricing

IPMVP option C “Whole facility” was chosen for the project. For the natural gas savings the natural gas consumption of the facility was chosen as baseline. Similarly, for the (relatively small) increase in electricity consumption, the electricity consumption of the facility was used. A baseline period from 01.05.2017 until 30.04.2018 was chosen.

Correlation analysis was performed for the natural gas consumption for heating degree hours (data from the weather station at the facility) and monthly production rates (paper used / month; productive hours / month). Only heating degree hours showed strong correlation with natural gas consumption and were therefore considered for regression analysis.
Furthermore, the natural gas consumption is dependent on the proper functioning of other waste heat recovery systems (compressed air production). Those systems are monitored by the building control system and issues that could occur are detected and can be considered accordingly in the calculation of energy savings for this ECM.

**Savings calculation**

Denkstatt-Enertec followed the tasks and documentation requirements of the ICP Complex Industry Protocol for the Savings calculation phase:

- **Develop initial savings estimates**
- **Establish preliminary cost estimates and financial metrics**
- **Develop a set of recommended ECMs**
- **Energy savings calculations** (inputs, assumptions, operational data, calculations, results for ECMs and set of ECMs)
- **Evaluate economics of each ECM and set of ECMs**
- **Obtain a fixed price for implementing each ECM**
- **Prepare a final report summarising ECMs**

Waste heat available from process cooling was calculated for every hour based on the entering and return temperatures of the two systems (Reiber-cooling and Motor-cooling, trend data from building control system) and the respective flow rate.

To calculate the expected savings, the theoretical potential that could be produced with a high temperature heat pump from the waste heat of the process cooling was calculated. In a second step the size of the heat pump was chosen and potential heat production was limited to the chosen capacity as well as the minimum part load operation possible. For different operating conditions different EERs were considered. In addition, a storage tank with a capacity to store 116,67 kWh was considered. In the last step, the heat production potential was consolidated with the actual heat demand for every hour of the baseline period. For the calculation of the natural gas savings an efficiency of the boiler of 90% was assumed.

Investment costs are based on contracted fixed costs from technology providers. The project has predicted annual energy savings of 984,5 MWh in natural gas, while an additional electricity consumption of 240 MWh was calculated on the basis of the heat produced and the COP for the respective part load for every hour. A payback period of 11.4 years is calculated. Generally, the delay in the preparation of this part of the documentation caused a delay in project certification.
Implementation plans

As required by the ICP Complex Industry Protocol, Denkstatt-Enertec had to develop the following three plans for the three implementation phases as part of their project development activities:

**Operational Performance Verification (OPV) Plan**
Ensure that ECMs are installed correctly and capable of achieving the predicted energy savings
- Qualified OPV professional
- Process targeted at implementation of ECMs
- Training plan, systems manual

**Operations, Maintenance & Monitoring (OM&M) Plan**
Systematic monitoring of energy system performance and implementing corrective actions
- Ongoing management regime
- Performance indicators
- Responsibilities, processes
- Training plan, user manual

**Measurement & Verification (M&V) Plan**
Comparison of actual and predicted performance to calculate the energy savings
- Qualified M&V professional
- M&V Plan according to IPMVP
  - Whole facility (Option C)
  - Part of facility (Option A/B)

For this, the plans from the first ICP-certified industrial project were used as a starting point and adapted to the specifics of the MediaPrint project.

**Project-specific support/reviews and quality assurance**

Throughout this process (from baselining and savings calculations to the development of the three plans), Denkstatt-Enertec provided its documentation electronically to Verco and Denkstatt (via Dropbox and email).

Accordingly, throughout this process, Denkstatt had an insight into the evolving project documentation and was in regular contact (through personal meetings, emails and phone calls) with Denkstatt-Enertec on the project’s progress and specific issues, with major updates in November 2018, January 2019, May 2019 and August 2019 as well as regular updates in-between. While project documentation was considered almost complete in the first review in January 2019, there was a significant delay until the additional documentation was submitted for a second review in August 2019. This highlighted that even in cases of almost complete documentation there can be situations where single issues can cause longer delays in project certification.

Denkstatt stayed in the information loop throughout project development and quality assurance with participation in conference calls and regular checks of the project documentation. As Denkstatt-Enertec used the English version of the ICP Complex Industry Protocol and most documents prepared by Denkstatt-Enertec were in English, there was no major need for translation support.
Apart from that, in terms of dissemination, Denkstatt was in touch with project owner MediaPrint to ensure that the project could be mentioned at a public event that Denkstatt co-organised together with the Austrian Climate and Energy Fund and other partners on 25 June 2018 in Linz. Moreover, Denkstatt-Enertec mentioned the project at the Austrian National Steering Group meeting in November 2018 and Denkstatt prepared documents for ICP communication purposes.

Verco, in its quality assurance role, provided support to Denkstatt-Enertec in developing the required documentation. Feedback was provided in a review tool, in spreadsheet format, which was created by Verco to cover each of the new protocols developed. The review tool generates the specific documentation requirements depending on the protocol being followed, and, as well as providing a record of which documentation has been submitted, it also provides a means of providing feedback to the project developer on any deficient areas. For this project, two major iterations of the review tool (as well as some further questions after the second iteration before the project was ready of certification) were necessary, corresponding to each round of review. In addition to various emails between project developer and quality assurance assessor, conference calls were also held to discuss the documentation submitted, with a particular focus on how the savings calculations had been developed – for most projects, this is an area which requires greatest effort by the quality assurance assessor.

In addition to the review of the documentation against the requirements of the protocol, technical guidance was also provided to the project developer. This included:

- Advice on the content of the three plans, using the templates available
- High level guidance on the content of the M&V plan, including selection of the appropriate Measurement & Verification approach, and requirements for addressing static factors
- Brief discussions on fixed costs and inclusion of electricity data in the baseline

**Status**

The project should became the second industry project to receive the Investor Ready Energy Efficiency™ Certification on September 3rd, 2019. Project dissemination on a European and Austrian level will be done in coordination with the project owner.
Lessons learnt

Generally speaking, the following characteristics of this specific project can be considered as particularly beneficial to the successful completion of the pilot project:

- Existing client relationship of project developer with project owner
- Existing project mandate, ICP certification as a valuable add-on for project owner
- No additional costs for project owner for ICP project development and certification
- Excellent technical know-how and broad industry project experience of project developer plus quick understanding of general requirements of ICP framework and specific issues
- Use of English version of ICP Protocol + PDS + Plan templates and preparation of documentation in English through project developer
- Direct communication between project developer and quality assurance assessor, while also keeping the ICP in-country advocate in the information loop
- Regular feedback between project developer and ICP in-country advocate
- Screen sharing sessions / telcos between the project developer and quality assurance assessor to discuss documentation submitted, particularly the baseline development and savings calculations
- Use of Dropbox to facilitate document sharing – in future, a proposed file structure may be provided by Verco to improve this process even further

A major issue for project owners and project developers is the additional effort (compared to “regular” project development) required on the project developer side for developing a project according to the ICP Protocol and having it IREE™ certified. Project developer Denkstatt-Enertec estimated this additional effort as follows:

<table>
<thead>
<tr>
<th>Required documentation</th>
<th>Availability</th>
<th>Additional effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project description</td>
<td></td>
<td>3.5 hours</td>
</tr>
<tr>
<td>- Company and ECM descriptions</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>- Baseline description</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>- Savings calculation description</td>
<td>~</td>
<td></td>
</tr>
<tr>
<td>Metered data for calculations</td>
<td>✗</td>
<td></td>
</tr>
<tr>
<td>Baseline (Excel calculations – correlation and regression analysis)</td>
<td>✗</td>
<td>3.0 hours</td>
</tr>
<tr>
<td>Savings calculation (Excel calculations)</td>
<td>✔️</td>
<td>3.5 hours</td>
</tr>
<tr>
<td>Excel summary on calculations (incl. profitability)</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Qualifications of project developer</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Offers from providers</td>
<td>✔️</td>
<td></td>
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<tr>
<td>OPV (Commissioning) plan</td>
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<td>1.5 hours</td>
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<tr>
<td>OM&amp;M plan</td>
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<td>M&amp;V plan</td>
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<tr>
<td>- Schemes</td>
<td>✔️</td>
<td></td>
</tr>
</tbody>
</table>
With regards to the three plans, Denkstatt-Enertec considers the following requirements highlighted in red as additional documentation compared to “regular” project development:

**Operational Performance Verification (OPV)**
- Qualified OPV professional
- Process targeted at implementation of ECMs
- Training plan, systems manual

**Operations, Maintenance & Monitoring (OM&M)**
- Ongoing management regime
- Performance indicators
- Responsibilities, processes
- Training plan, user manual

**Measurement & Verification (M&V)**
- Qualified M&V professional
- M&V Plan according to IPMVP
  - Whole facility (Option C)
  - Part of facility (Option A/B)

Compared to the first industrial pilot project, Denkstatt-Enertec’s data indicates that the additional effort of developing the project according to ICP was significantly lower for the second project (around 15 compared to 30.5 additional hours). Moreover, fewer review iterations were required for the second industrial project (two vs. four iterations), since the project developer had a clearer understanding of the requirements of the protocol, and also because many of the documents are similar to those produced for the first project.

**Benefits of the project Certification for the client**
Apart from the planned energy savings, the application of the ICP framework could provide additional benefits to project owner MediaPrint. Based on feedback from project developer Denkstatt-Enertec, compared to the standard approach of developing such projects additional focus is put on:

- the normalisation of the energy baseline (correlation and regression analyses),
- the development of the implementation plans, in particular
  - tasks and responsibilities,
  - training documents and manuals, as well as
  - systematic monitoring and correction measures.
According to Denkstatt-Enertec’s view, the project owner particularly benefits from:

- more robust savings calculations and a more robust baseline for the verification of energy savings,
- an additional layer of quality assurance, and
- a stronger focus on the planning of proper project implementation (in addition to regular project development scope).