Power Generation Service
Energy efficiency in power generation and water
Opportunity identification overview

The opportunity identification phase of Industrial Energy Efficiency (IEE) is the primary step to deliver a comprehensive energy reduction and optimisation programme. The study identifies specific opportunities to deliver improvements by understanding how and where energy is used. The three areas of assessment are considered across each aspect of the industrial site:

- **Technology and control**
  - The opportunity identification study assesses the efficiency of existing utility systems and identifies improvements through process control, equipment modification or alternative energy efficient technologies, typically covering the following energy systems:
    - Compressed air and industrial gases
    - Fired equipment (heaters, furnaces etc.)
    - Steam boilers and steam systems
    - Industrial refrigeration and chillers
    - Heating, Ventilation and Air Conditioning (HVAC)
    - Cooling water and water treatment facilities
    - Electrical systems – high voltage and site users

- **Monitoring and targeting (M&T)**
  - As a key element of an effective energy management programme, assessment of the M&T of site process, utilities and organisational aspects versus best practice considers:
    - The presence and extent of energy metering and recording
    - KPI and ongoing performance assessment
    - M&T integration with energy management

- **Behaviours and practices**
  - Assessment of behaviours and practices relating to energy efficiency across site process and utility operations through a comprehensive review versus best practice, including:
    - Energy strategy and policy
    - Capital investment
    - Information technology
    - Operational management
    - Operational planning and performance
    - Energy management
    - Training and development
    - Staff motivation
    - Maintenance

- **Industrial process expertise**
  - ABB’s in-house engineering teams have successfully delivered energy improvements with process energy optimisation in:
    - Oil and gas processing; metals, mining and minerals; power;
    - Chemicals; pulp and paper; life sciences and food & beverage industries

The three areas of assessment may be considered separately or together as part of a complete programme.
**Benefits**

ABB’s opportunity identification phase has a proven methodology to identify 5% to 20% savings of your site energy bill, through identification of energy saving opportunities in site utilities and processes, assessment of behaviours & practices and monitoring & targeting strategies.

**Methodology**

The opportunity identification methodology follows a well-established process, tailored to specific client and site requirements. At the start of the study, ABB will issue a request for information, including utility consumption data, Process Flow Diagrams (PFDs) and other information where applicable.

ABB will perform an initial data review of the information provided before visiting the site. The ABB team will visit the site to review the physical condition of the assets, confirm the data provided, validate and develop the findings of the initial data review and resolve inconsistencies or fill gaps in the information through interviews with key site personnel.

Following the site assessment, ABB will continue to analyse the additional information acquired from site to identify and confirm energy saving opportunities. The objective of the opportunity identification phase is to produce a portfolio of attractive energy saving opportunities, with:

- A description of the energy saving opportunity and system(s)
- An estimated range of energy savings
- An estimate of the likely investment range for implementation
- An understanding of the likely payback times of the portfolio

**Deliverables**

The deliverables of each opportunity identification study will be tailored to meet requirements, however typical deliverables may include any of the following:

- The opportunity identification portfolio
- Opportunity identification payback chart
- Opportunity summaries
- Energy maps
- Sankey diagrams
**Master plan overview**
The master plan is the second phase of an Industrial Energy Efficiency programme and develops an existing portfolio of energy saving opportunities into a comprehensive implementation plan, with consideration and assessment of the key aspects of each project, in conjunction with our clients. The master plan is a continuous process, concurrent with the implementation of energy saving projects and is overseen by an appointed programme manager who liaises throughout this phase with our client’s organisation, ABB personnel and third party vendors where applicable.

**Methodology**
The master plan is tailored to meet requirements; however the following process flow diagram depicts the main elements of a typical master plan.

**Alignment workshops**
A series of alignment workshops are conducted with our client at the beginning of the master plan phase, considering the key aspects of each energy saving opportunity within the portfolio, including:

- Agreement upon the magnitude of energy savings and likely investment range
- Removal or reduction of assumptions
- Identification of potential constraints
- Availability of data to confirm opportunity

**Prioritisation process**
The prioritisation process is typically conducted in conjunction with the alignment workshop(s) with the object of prioritising the energy saving portfolio, according to four parameters:

- **Feasible**
  The technical feasibility and data confidence of the energy saving opportunity
- **Simple**
  The business impact and development requirements of the energy saving opportunity
- **Quick**
  The time scale to implement the energy saving opportunity, including budget & site availability
- **Payback**
  The estimated time to achieve a complete return on investment
Project portfolio
At the close of the alignment workshop(s) and prioritisation process, an agreed project portfolio is developed with energy saving projects prioritised into three categories:

– Quick win projects for immediate implementation
– Tier 1 – Projects selected for immediate development towards implementation
– Tier 2 – Projects that require further information prior to selection and development

Enabling programme
The enabling programme is the mechanism to drive rapid implementation of energy saving projects and to maximise the cash flow from the Industrial Energy Efficiency programme. It is overseen by the programme manager and includes the development, specification and implementation of projects along with the confirmation of selected tier 2 opportunities.

Project specifications (tier 1)
For all projects selected in tier 1 of the project portfolio, a project specification is developed to enable implementation, including:

– Identification of technical, environmental and health and safety risks
– Benchmarking of current performance, confirmation of savings and payback estimates
– Estimation of the implementation costs of the selected project solutions
– Development of benefits verification and measurement methodology
– Compilation of comprehensive implementation schemes and key assumptions

Opportunity summaries (tier 2)
For each project in tier 2 of the project portfolio, the opportunity summary is developed to enable confirmation of the energy saving project, prior to selection, including:

– Opportunity description
– Further information required
– Project confirmation schedule
– Likely timescale & resources

Tier 2 projects are promoted to tier 1 and project specifications developed in accordance with the confirmation schedule and consolidation process.

Consolidation
The consolidation component of the enabling programme is a series of periodic workshops designed to:

– Review and validate the value of the programme with savings verification for implemented projects
– Review & prioritise tier 2 opportunities, promoting to tier 1 for project specification
– Identify constraints, confirm budget cycles and optimise the ongoing implementation schedule

For multi-site & strategic IEE programmes, the consolidation process is often conducted at a regional level, in addition to site-based coordination activities.
Implementation overview
Implementation of energy saving projects is the third phase of the Industrial Energy Efficiency (IEE) programme, driven as a continuous process by the master plan.

Organisation to deliver
The implementation team and resource requirements are specific to individual energy saving projects, ranging from:

– Quick win projects requiring little resource
– Large capital investment projects requiring significant project feasibility, design, execution and procurement of equipment and / or technology from third party vendors

An IEE programme typically develops a portfolio of projects with a mixture of resource and competency requirements and as such, requires dynamic access to a diverse range of expertise.

The flexibility of the IEE programme approach resources can be provided by ABB, the client’s organisation, or third party organisations where applicable.

The programme manager retains overall responsibility for the successful implementation of the programme, utilising resources from the best available source for each project task.

Implementation project examples
A portfolio of energy saving projects ranges from simple through to complex implementations, including, in ascending order of complexity:

– Optimisation of process set-points and parameters (e.g. flue gas oxygen concentration control for fired equipment)
– Optimisation of control loop or equipment sequencing (e.g. fan system control for ventilation systems)
– Additional instrumentation for improved control or monitoring and targeting (e.g. compressed air system demand and consumption)
– Replacement / switch-out of auxiliary / balance of plant equipment for efficiency (e.g. correct sizing of cooling water system pumps)
– Improvements in behaviours and practices (e.g. incorporation of energy efficiency requirements within standard procurement cycles)
– Upgrade or replacement of key equipment and / or site processes (e.g. upgrading to variable speed drives for major equipment)
– Design and installation of new sub-processes and equipment to improve energy efficiency (e.g. installation of economisers for improved heat recovery on steam boilers)
– Feasibility, design and installation of major processes and equipment to improve energy efficiency (e.g. installation of gas turbine cogeneration unit for on-site generation of energy efficient electricity and heat)
Implementation team and resources

For a typical Industrial Energy Efficiency programme, the resource mix of the team for individual projects will be driven by the nature of the projects themselves and the in-house capabilities of our client’s organisation.

Five key aspects of resource requirements and their source are considered project-by-project, as depicted below:

Management - Successful implementation of the IEE portfolio is driven by close collaboration between the ABB programme manager and the client sponsor.

Expertise - On an individual project basis, the mix of client and ABB team expertise can be selected according to the project requirements. For some simple projects, further expertise may not be required.

Engineering - On an individual project basis, project design can be provided by ABB, or where the client organisation has in-house capability, the client project team. For some simple projects, project design may not be required.

Execution - On an individual project basis, installation and commissioning can be provided by ABB, or the client organisation where inhouse capability or preferred contractor resources exist. For some simple projects, project execution may be conducted without significant resource.

Technology - ABB is a world leader in the supply of energy efficient power and automation technologies and is also able to identify and acquire appropriate technologies from specialist third party vendors, in order to support rapid Implementation of the IEE programme.

For further information on the Industrial Energy Efficiency programme, please contact the local ABB representative.