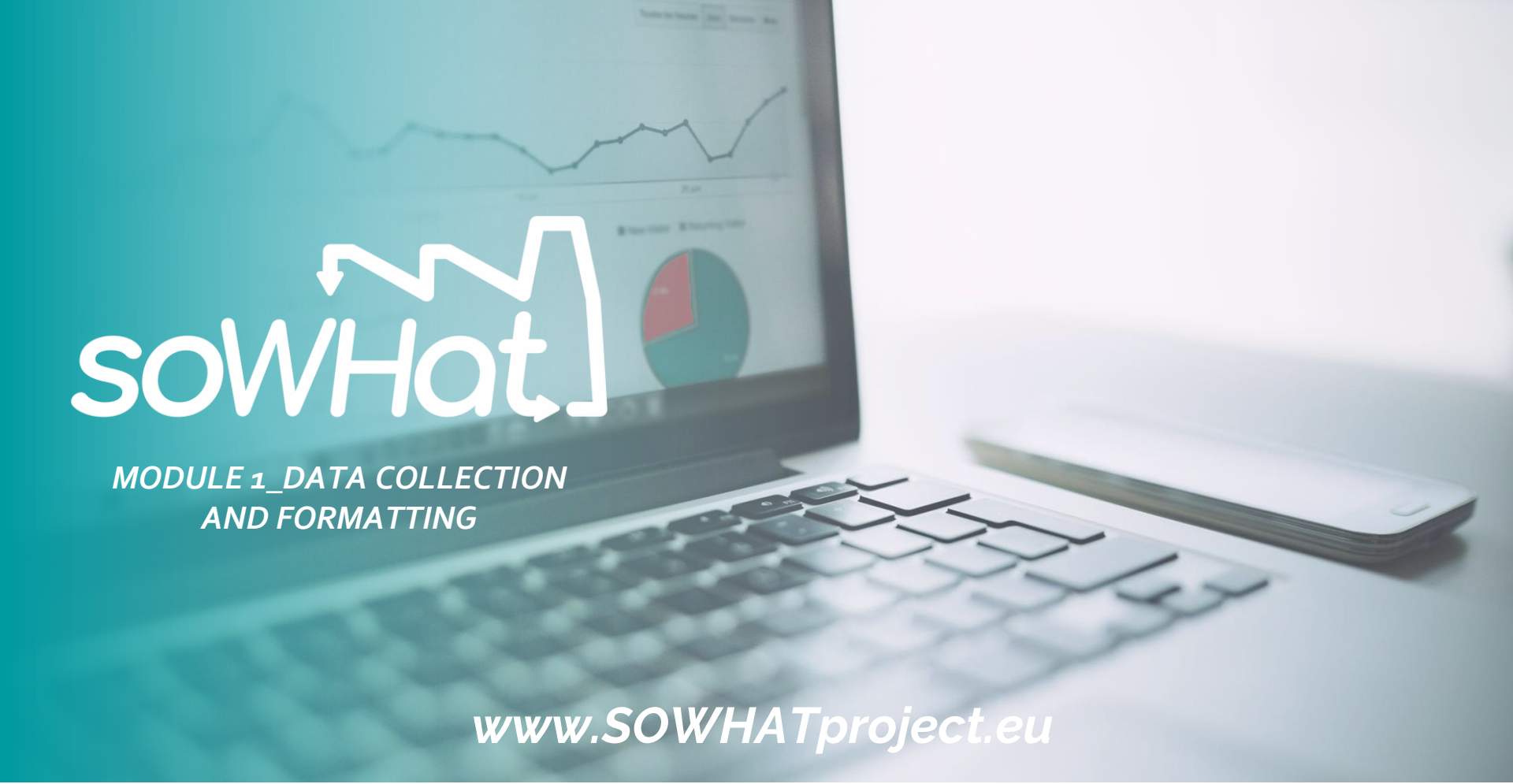

MODULE 1_DATA COLLECTION AND FORMATTING

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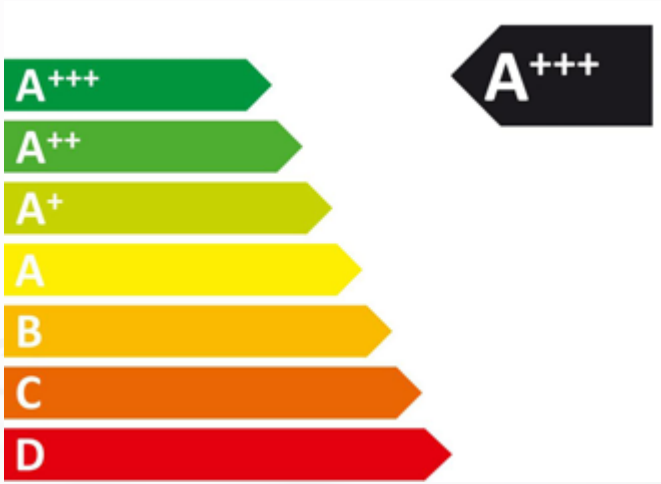
Summary

- Introduction to Energy Audits
- Data Collection Approach
- Data Formats
- Barriers to Data Collection
- Energy Performance Indicators
- Data Sources



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Energy Audit

"an energy audit is a systematic inspection and analysis of the energy use and consumption of a plant, building, system or organisation, with the aim of identifying and reporting on energy flows and the potential for energy efficiency improvements"

(EN 16247-1)

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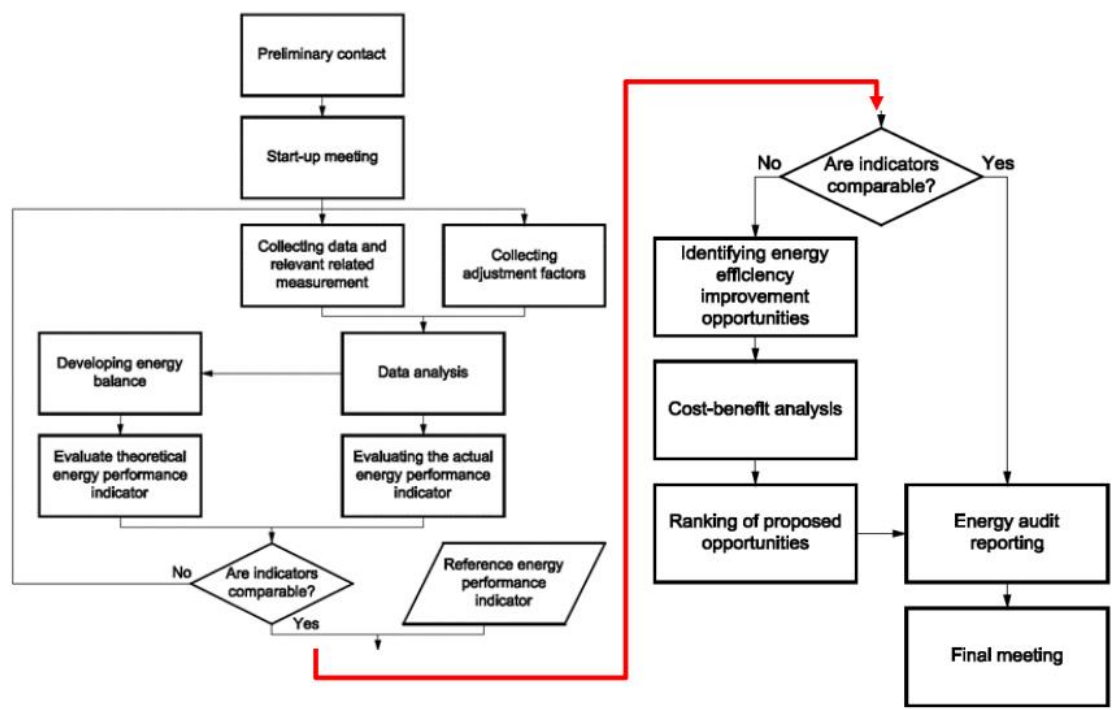
Energy Audit Process

- Kick-off meeting
- Data collection on:
  - energy consumption
  - plant production
  - equipment features
- Site visit
- Analysis
- Reporting
- Final meeting



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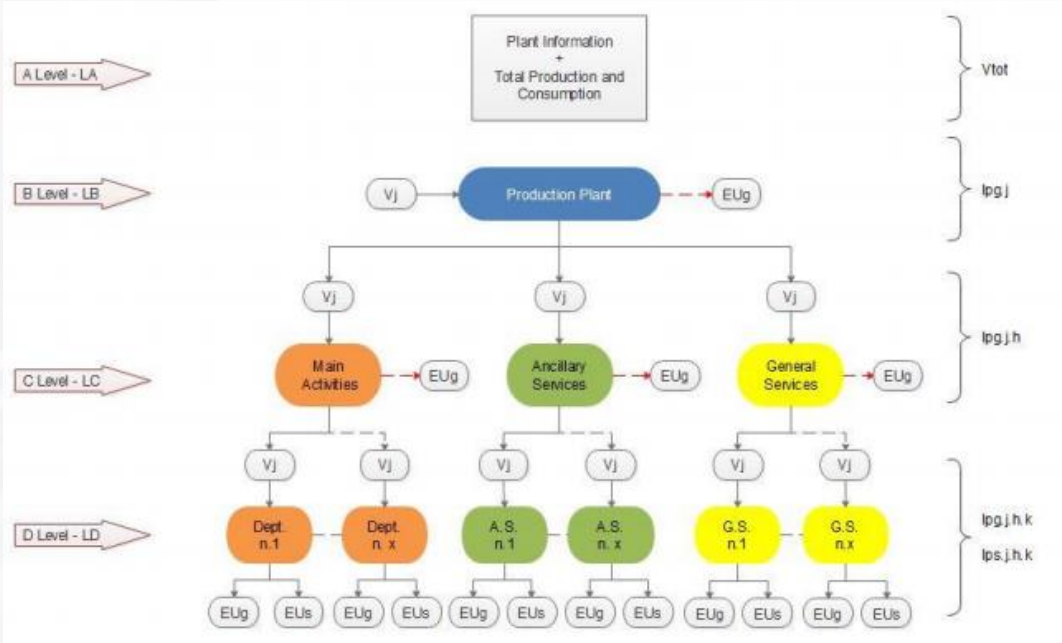
Plant Energy Model

- Plant energy model
- One per each energy carrier (electricity, natural gas, etc.)
- Breakdown into:
  - Main Activities
  - Ancillary Services
  - General Services
- Breakdown by functional area
- Basis to determine energy balances and indicators



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Functional Areas

- **Main activities:** processes related to the specific plant production, e.g. main furnace in a glass plant, kiln system in a cement plant, etc.

- **Auxiliary services:** activities supporting the main ones, e.g. compressed air systems, steam/water boilers, chillers, materials handling systems, etc. → *their consumption is generally proportional to plant production*

- **General services:** activities indirectly linked to the main processes, e.g. lighting, HVAC, offices, etc. → *their consumption is not proportional to plant production*

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SO WHAT Data Collection Approach

1. **Use case identification**
2. **Data collection** according to a dedicated checklist
3. **Data formatting** (if available in different formats)
4. **Data upload** to the tool
5. **Data mapping** according to energy carrier, process, end-use, etc.
6. **Rough-cut profiling** if only low-resolution data are available
7. **Data processing** to achieve energy input/output profiles
8. **Building model** (if needed)
9. **Industrial process component model** (for each department)
10. **Data syncing with process components**
11. **Energy Sankey diagram** to visualize main WH/C sources

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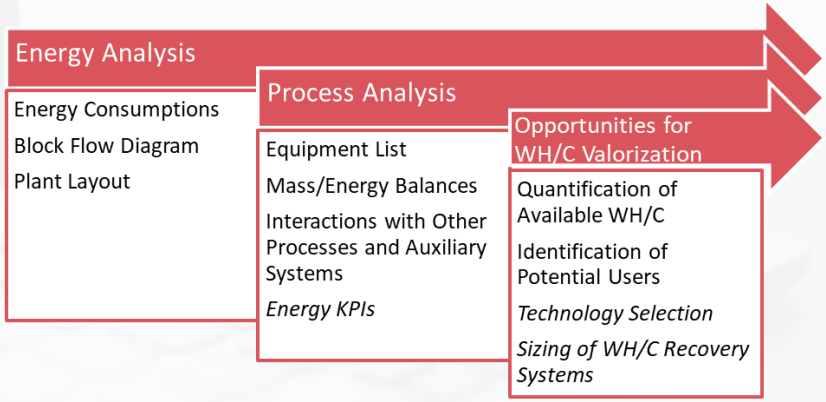
SO WHAT Data Collection Approach

- Energy analysis
  - at plant level
  - general information on processes
- Process analysis
  - at department/process level
  - details on machinery
- Focus on WH/C
  - quantification of available energy
  - identification of potential users
  - selection and sizing of recovery technology



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Data Formats

- no standard format exists for input data
- generally information is quantitative or qualitative

Quantitative Information (generally Excel spreadsheets)	Qualitative Information (generally PDF documents)
elaborations on energy consumptions and costs done for energy management or project controlling purposes at corporate level	energy bills and invoices produced by suppliers
output of energy monitoring systems at different time resolutions based on own meters or on suppliers' data	energy audit reports, feasibility studies, design documents for energy-related interventions
list of machines, elaborated for maintenance or asset management scopes, or created on purpose for energy management activities	technical datasheets for installed equipment
data on plant production and raw materials consumption, costs and revenues, etc.	offers and proposals by potential suppliers for new equipment
	scanned versions of drawings, layouts and diagrams realized in the past or made not available in an editable format

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Barrier to Data Collection

- confidentiality issues
- availability of detailed data only on core processes/machines
- lack of monitored data on heat carriers
- lack of detailed information on buildings and H&C demand
- non-standard availability of documents in different plants
- non-standard format of information across different plants

Main Barriers Identified

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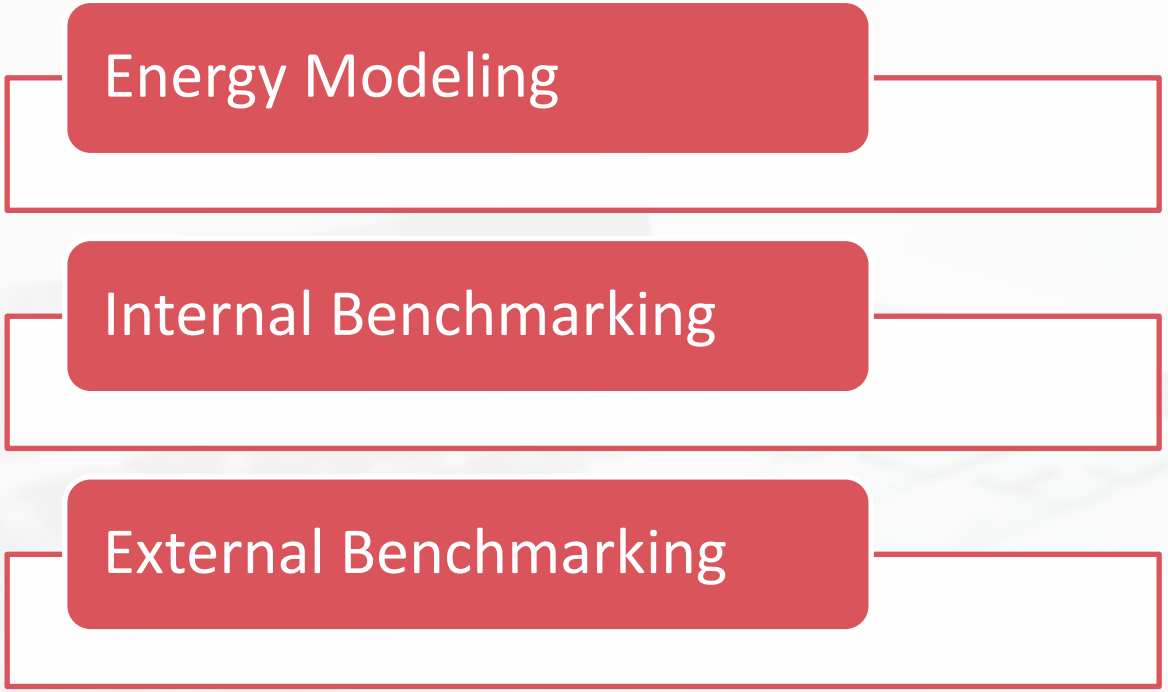
Energy Performance Indicators

- Main purposes of EnPI



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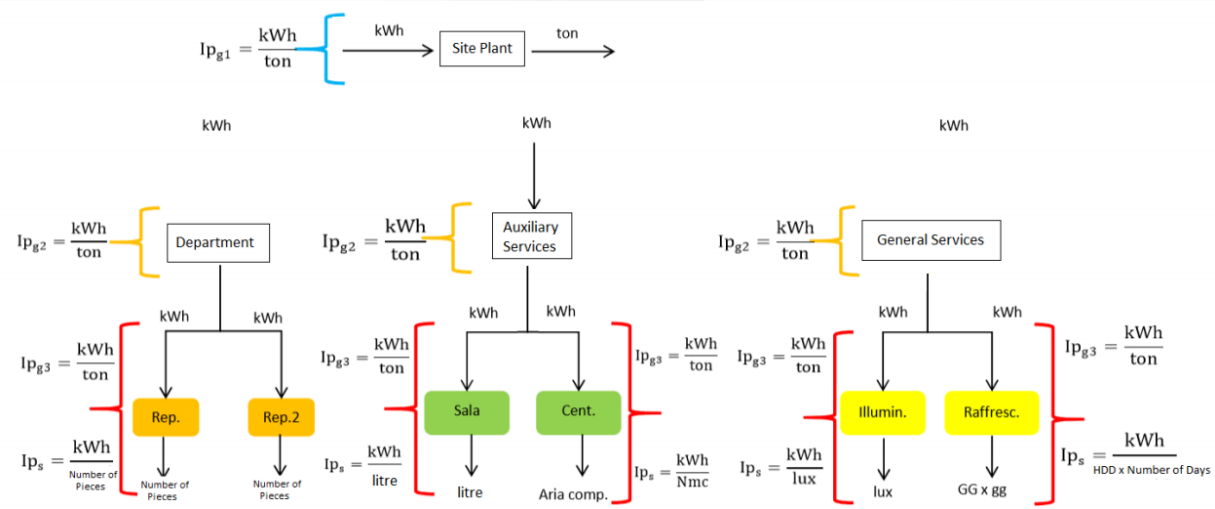
Energy Performance Indicators

- Level A – total energy consumption, whole plant
- Level B – by energy carrier, whole plant
- Level C – by energy carrier, main activities-auxiliary-general services
- Level D – by energy carrier and machine



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Data Sources

Type of Information	Potential Source
Industrial Site Information	• Site layout • Energy audit report • Block flow diagram, P&I diagrams • Asset databases • Technical datasheets
Waste Heat/Cold Recovery & Renewable Heat/Cold and Electricity	• Technical datasheets • Data from sub-metering systems
Industrial Site Processes Information	• Block flow diagram, P&I diagrams • Asset databases • Technical datasheets • Data from sub-metering systems • O&M procedures

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Data Sources

Type of Information	Potential Source
Industrial Site Services Information	• Block flow diagram, P&I diagrams • Asset databases • Technical datasheets • Data from sub-metering systems • O&M procedures
Automated Meter Reading Data and Energy Costs Information	• Energy bills • Data from sub-metering systems • Technical datasheets
General Building Information	• Cadaster data • Energy performance certificate • Technical drawings • Site photographs

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THANK YOU FOR YOUR PARTICIPATION

SOWHAT TEAM

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