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Technical workshop
"Energy audits in buildings – from theory to practice"
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Examples of templates of energy audits in buildings and minimum requirements for the energy audit reports

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THE PRESENTATION OUTLINE

① GENERAL OVERVIEW

② LITHUANIA CASE

③ MOLDOVA CASE

④ GEORGIA CASE

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THE BASIS FOR METHODOLOGY IS DESCRIBED BY EUROPEAN AND INTERNATIONAL STANDARTISANTION ORGANISATIONS

The existing standard for energy audits:

- EN 16247-1 (2020) Energy audits - Part 1: General requirements
- EN 16247-2 (2020) Energy audits - Part 2: Buildings
- EN 16247-5 (2020) Energy audits - Part 5: Competence of energy auditors
- ISO 50002:2014 Energy audits — Requirements with guidance for use

Will be replaced by:

- ISO/DIS 50002-1 Energy audits — Requirements with guidance for use — Part 1: General requirements
- ISO/DIS 50002-2 Energy audits — Requirements with guidance for use — Part 2: Buildings

Defines the requirements for **qualification** of person performing an energy audit

Provides flexible **framework** for how energy audit should be shaped

Describes the **structure of the report** (provides basis for energy audit template)

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DIFFERENT APPROACHES OF METHODOLOGY AND MINIMUM REQUIREMENTS MAY BE TAKEN

Different cases may be applied depending on the maturity of the legislation:

Refers to the European standards as a theoretical basis

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+

Minimum requirements for energy audit

Adapts the requirements of European standards together with additional requirements

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THE TEMPLATES MAY HAVE DIFFERENT LEVEL OF DEVELOPMENT

Level of detail/development

No template and no requirements for the reporting

General requirements for structure (stated in methodology)

Detailed template document with structure, tables, sample text (?)

Detailed template with places for replacements

Too specific, could be developed in private company for internal use

Expanding and developing the structure

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BASED ON EUROPEAN STANDARDS, THE KEY ELEMENTS IN THE REPORT SHOULD DESCRIBE INPUTS, CALCULATIONS AND MEASURES

Inputs, definitions explanations about situation	*Needed to validate inputs and clarify that the suitable data is used to perform the analysis. It may be reused in case of recalculation procedures*
Calculation and saving identification procedures	*Needed to show how the energy consumption is splitted to the parts (break-down), may be usefull for QA in order to check if the right results is obtained*
Proposed energy saving measures	*Required for the audit client in order to know HOW to improve the energy use efficiency*
Additional material, Appendices	*The information that is to detailed, but needed to justify the assumptions and other important data according to auditors opinion*

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THE ENERGY AUDIT REPORT MAY BE SEEN AS INTERFACE TO DIFFERENT USE CASE

Audit customer,
Financial support provider:

- List of measures
- Recommendations (What to do next?)
- The required investments
- Possible saving of the costs

Quality assessment:

- Input data used for calculations (What was used to provide recommendations?)
- Applied assumptions (How the unknowns were handled?)
- Validity of data
- References to applied methodologies (How it was calculated?)

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EXPERIENCE AND LEGISLATION DEVELOPMENT IN LITHUANIA STARTED 22 YEARS AGO

1996

Since 1996 (to 2004) the energy audits were done for external donors' support (World Bank, PHARE)

2004

Lithuania joins EU

2008

Methodology

2022

Updated Methodology

Template

Software tool

Non-regulated Energy audits have enabled the buildup of the capacity and knowledge needed for energy efficiency and energy performance of building policies. The research institutions stepped in and provided competence and service for early pilot projects.

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THE METHODOLOGY UTILISES EXISTING LEGISLATION COVERING THE SAME BUILDING PHYSICS ASPECTS WITH MODIFICATIONS

The methodology relies on the energy balance calculations presented in EPC methodology, but modifies specific aspects:

From *Energy performance certification regulation*:

- Heating/cooling balance
- Building envelope performance
- Calculation procedures for heating, air-conditioning, ventilaton and hot water systems

+

In energy audit methodology

- Changes the fixed assumptions about temperature, occupancy, heat gains, air-change rates
- Detailing and extending cooling consumption
- Adding aggregation of actual (metered) energy consumption
- Calculation model calibration procedures

=

Structure of methodology:

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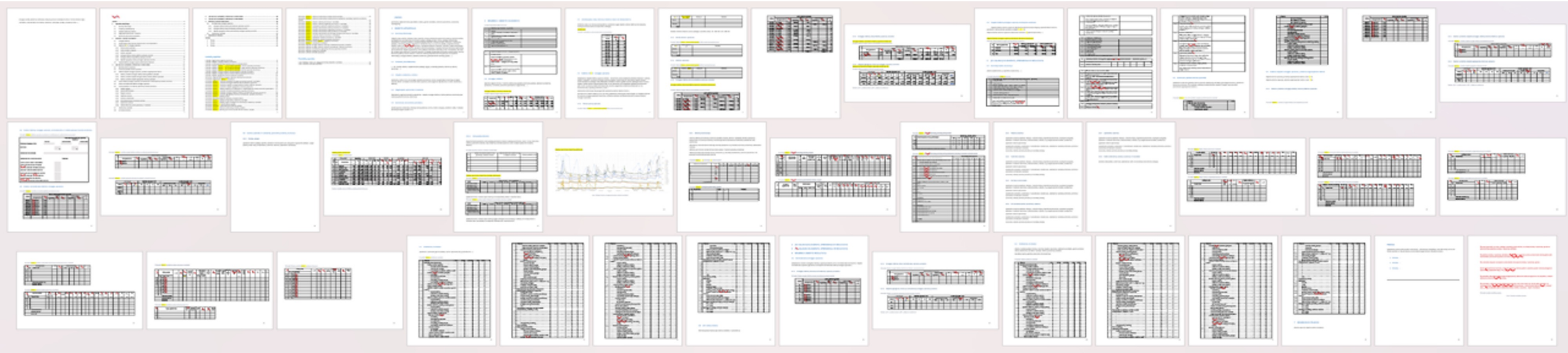
THE TEMPLATE WAS PROPOSED TO HELP AUDITORS TO BETTER STRUCTURE THE REPORT AND SIMPLIFY QUALITY CONTROL

The template was introduced together with an updated methodology and introduced calculation software in the beginning of 2023

Key elements of template structure:

- Introduction (executive summary)
- Description of the object
- General data about the object
- Building part data, solutions and results
- Full building results
- Conclusions
- Annexes



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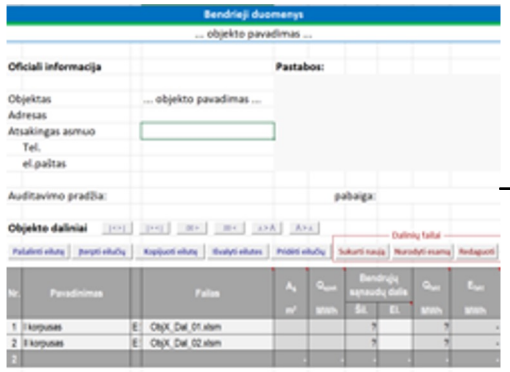
THE SOFTWARE WAS INTRODUCED TO SIMPLIFY AND IMPROVE THE CALCULATION PROCESS

Building



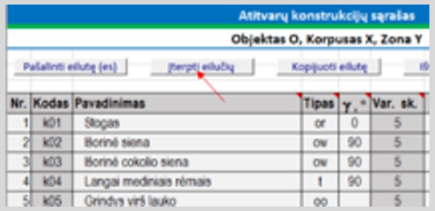
Weather conditions

Part 1

Part 2

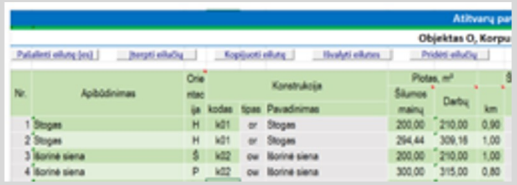
Part 3

Constructions



Building spaces

Surfaces



Domestic hot water

Energy sources

Actual energy consumption

Ventilation system

Other parameters

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THE HIGHLIGHT OF LITHUANIA CASE

2022

No standardized calculation **tool or software**

→ Since the beginning of 2023, auditors are asked to provide **calculation software** file together with report.

Prior to 2023, only audit reports based on the **outline structure** provided in the bylaw were submitted

→ A t**emplate** for the energy audit report is provided as an addition to the defined outline of the report (in the legislation)

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THE ENERGY AUDIT SYSTEM IN MOLDOVA WAS STARTED BY ADOPTING EXTERNAL DONOR PRACTICES

2018 **2020** **2022**

Before the establishment of the legal status of energy audits - existing practitioners were using ENSI software for external donor support.

Template

Methodology

Template

The starting point of legislation-enabled energy audits was based on the template only. This approach faced issues for quality, transparency and replicability. It was difficult to perform quality control for the provided audit reports.

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THE TEMPLATE

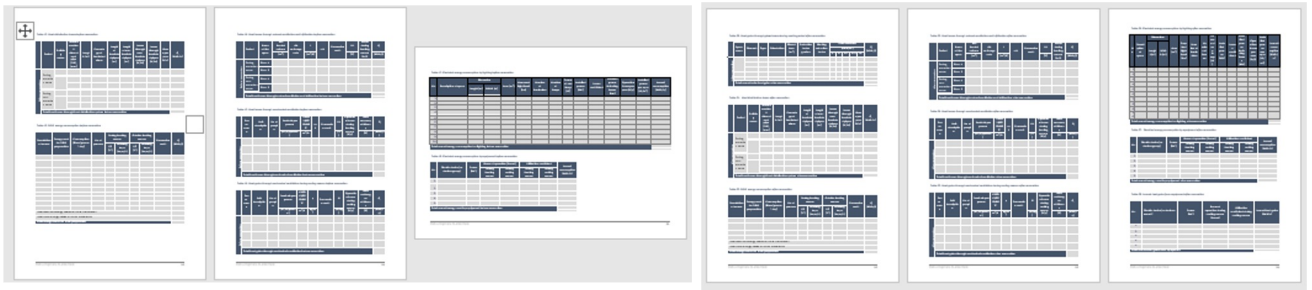
Before the update of the existing Template in 2020:

- EA reports were getting too long, difficult to navigate and read
- It was not clear which standards energy auditors were using when making calculations
- Auditors weren't following the template and didn't provide all the information requested
- Controlling institution didn't have any instrument to influence the process (previous Regulation on energy audits didn't foresee quality assessment of EAs)

Template after 2020:

Separation of input data ensures, report provides fluent representation of analysis for the clients

+ Additional input XLS ensures that data required for detailed QA is provided:



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THE METHODOLOGY WAS INTRODUCED TO CLARIFY THE REQUIREMENTS AND ENSURE THAT THE SAME PROCEDURES WOULD BE FOLLOWED

- To have a rule set to enable quality screening - the methodology should state the steps of the energy audit
- The methodology should state requirements information presented in the energy audit report
- <u>Main parts of methodology:</u>

I. GENERAL PROVISIONS
II. REFERENCES
III. TERMS AND DEFINITIONS
IV. STAGES OF AUDIT IN BUILDINGS
V. COLLECTION OF OBJECT INPUT DATA
VI. MEASUREMENTS OF ENERGY PARAMETERS
VII. TECHNICAL ANALYSIS (…)
VIII. CONVERSION OF ACTUAL ENERGY (…) FOR THE NORMALISED SEASON
IX. SELECTION OF ENERGY SAVINGS MEASURES AND IDENTIFICATION OF POSSIBLE SAVINGS
X. ESTABLISHING THE BALANCES OF ENERGY CONSUMPTION IN THE BUILDING
XI. EVALUATION OF (…) ENERGY SAVING MEASURES
XII. PREPARATION OF THE AUDIT REPORT

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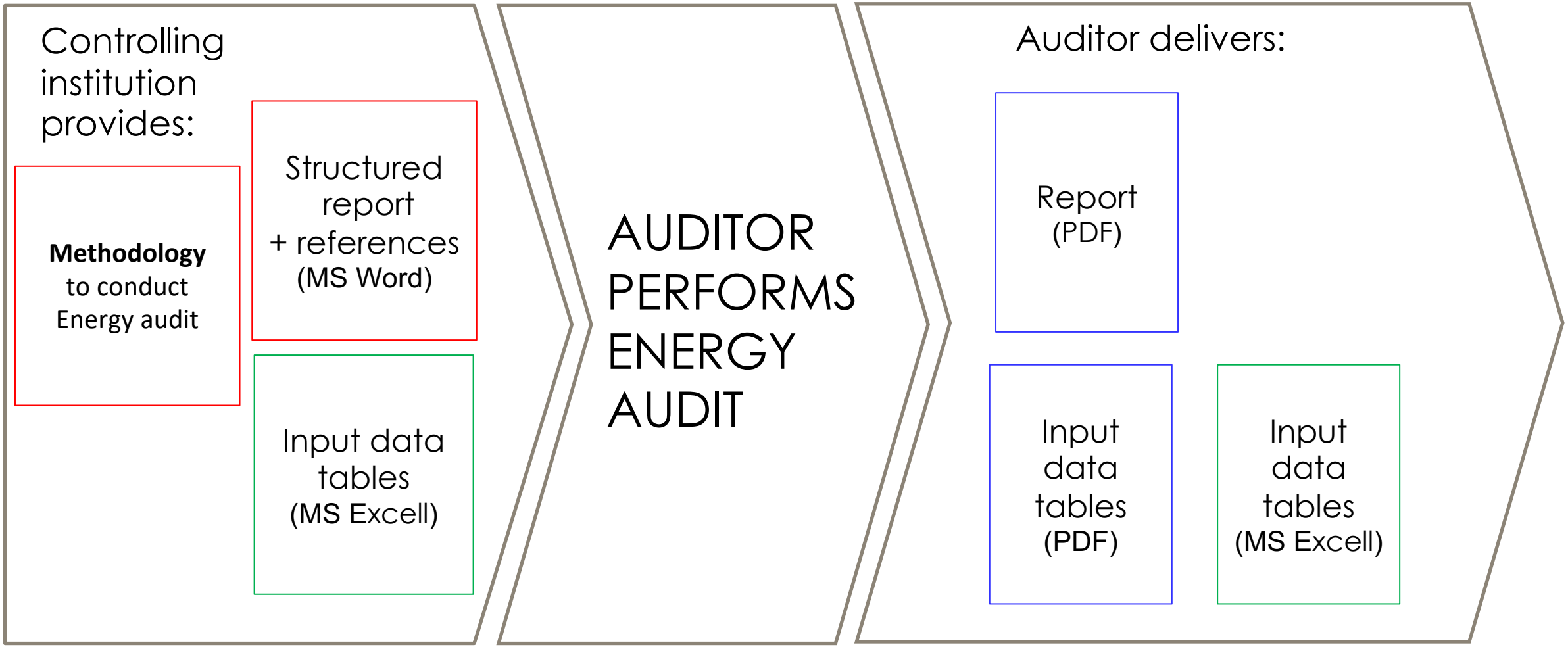
PROPOSED APPROACH TO REHABILITATE ENERGY AUDITS AND ENSURE TRANSPARENCY, CONSISTENCY AND BETTER QUALITY



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IN GEORGIA THE SYSTEM BASED ON EU BEST PRACTICES WILL BE STARTED IN THE BEGINNING OF THE 2024

2010's

existing practitioners were using ENSI software for external donor's support

2022

EU-funded capacity building project Georgia Energy Sector reformation Programme (**GESRP**)

2024

- Methodology
- Template
- Software tool

In the GESRP project, the synergies between the parallel implementation of Energy efficiency and Energy performance directives helped to create an innovative approach for Energy audits and EPC

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THE METHODOLOGY IS ESTABLISHED BASED ON BEST PRACTICES FROM EU COUNTRIES

General part related to responsibilities of energy audit process participant and other process aspects

The part related to building energy auditing:

Energy audit process stages	Process of building energy audit
1. Data collection (inputs)	Article 2. COLLECTION OF INPUT DATA DESCRIBING THE OBJECT
2. Analysis procedures	Article 3. BALANCE OF HEAT ENERGY CONSUMPTION OF THE BUILDING Article 4. CALCULATION OF ACTUAL HEAT ENERGY CONSUMPTION FOR ROOM HEATING FOR THE NORMAL HEATING SEASON Article 5. TECHNICAL ANALYSIS OF ENERGY, COLD WATER CONSUMPTIONS AND COSTS, ENERGY AND COLD-WATER CONSUMPTION BALANCE SHEETS
3. Measurements	Article 6. MEASUREMENTS OF ENERGY PARAMETERS
4. Identification of improvement measures	Article 7. CHOOSING IMPOVEMENT MEASURES AND DETERMINING POTENTIAL SAVINGS
5. Evaluation of measures	Article 8. ASSESSMENT OF ECONOMIC EFFECTIVENESS OF IMPROVEMENT MEASURES
6. Reporting	Article 9. PREPARATION OF THE AUDIT REPORT

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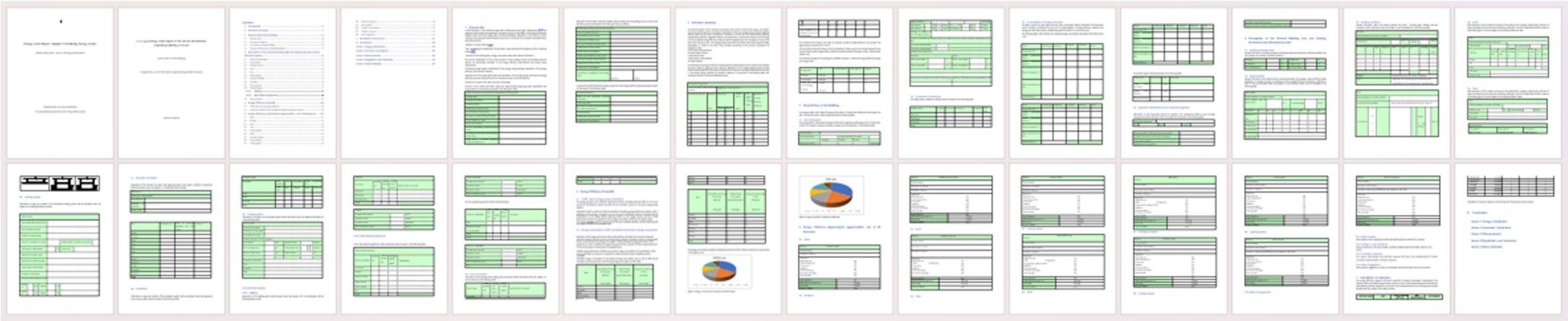
THE TEMPLATE IS PROVIDED AS A RECOMMENDATION TO SHOWCASE THE RIGHT STRUCTURE AND PROVIDE AN EXAMPLE FOR NEW ENERGY AUDITORS

The legal document

The template as a recommendation

The structure:

- Introduction
- Executive summary
- General data about the building
- Description of mechanical systems
- Energy efficiency potential
- Improvement opportunities
- Calculation of emission
- Conclusion
- Annexes



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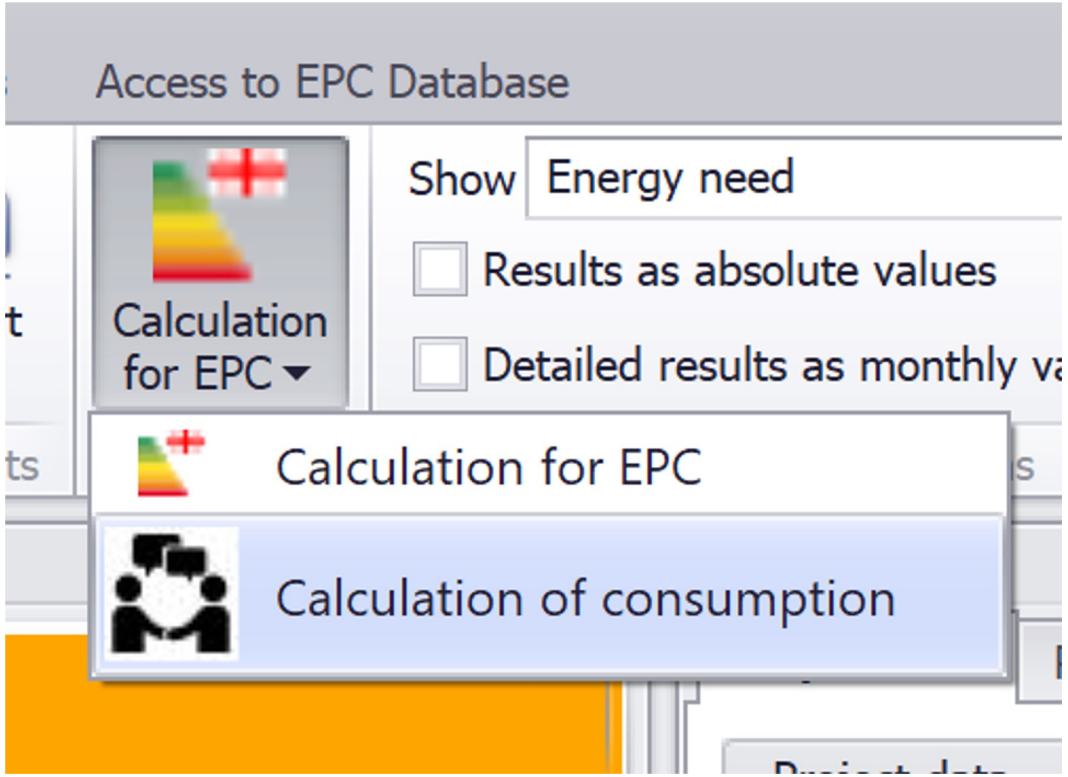
SOFTWARE TOOL ISSUING CALCULATED EPC RATING IS ADOPTED TO HELP CONDUCT ENERGY AUDIT

In the buildings case, the software tool used for energy performance certification (EPC) is adapted. The core energy demand calculation model is reused. **The calculation model could be switched to consumption mode and that allows it to operate with actual energy consumption data**.



That will allow:

1. Ensure consistency over the calculations
2. Increase efficiency of auditor work
3. Provide standardized visuals
4. Have flexible approach to calculate building engineering systems
5. Simplify the training of energy auditors
6. Reduce maintenance needs (due to the same core calculation model)

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SUMMARY: KEY TAKE AWAYS

- The basis for the methodology is typically based or directly transferred from European or International standards
- The templates provide the structure and example of how an energy audit report should look like
- The energy audit report may be seen from different perspectives – so they have to be designed to serve different purposes
- The cases from Lithuania, Moldova and Georgia illustrate possible differences in ways to handle methodology and templates

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EXAMPLES OF TEMPLATES OF ENERGY AUDITS IN BUILDINGS AND MINIMUM REQUIREMENTS FOR THE ENERGY AUDIT REPORTS

THANK YOU FOR YOUR ATTENTION !

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„Helping to Unlock the Value of Energy Efficiency and Sustainability for a More Resilient Future “

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