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Dr.Fernando Farias

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**COPENHAGEN CENTRE
ON ENERGY EFFICIENCY**
SEforALL EE HUB

Module 5

Measurement, Reporting and Verification (MRV) Systems

ffar@dtu.dk



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Components of an MRV system

- ❑ **Measurement** Component that refers to the collection of information to monitor the progress of the implementation and impacts related to an energy saving action, with an impact on mitigating GHG emissions;
- ❑ **Report** Component, once the measured information has been delivered, it needs to be reported in a defined and transparent manner to the corresponding authorities;
- ❑ **Verification** Component, means an evaluation of the information that is presented, in terms of its completeness, coherence and reliability by a third party.

Use of an MRV system

- ❑ Ensure, in a transparent manner, that the results of the implementation of GHG emission mitigation actions take place and that their impacts are being appropriately quantified and reported.
- ❑ An MRV system can be part of a more integrated monitoring system, which can then be seen as a breakthrough in periodic measurement (short, medium and long term).
- ❑ It can also provide feedback on progress made (or not) for decision makers, who can use the information in various ways to improve the effectiveness of government policies.

Applicability of an MRV system to EE municipal projects

- ❑ Tool that monitors in a specialized and exact way the impact generated by these projects and how they are progressing.
 - ❑ Information can be crucial to gain the interest of stakeholders, attract financial support and contribute to the subsequent implementation of these projects.
- ❑ Ongoing performance evaluation to improve project operation and performance, and allow cross-project comparisons, as well as supporting municipalities in future investment / procurement decision making.

Measurement in the MRV system

- ❑ Evaluation of indicators, identify the impact (savings) as a result of the implementation of the project, mainly in terms of:
 - ❑ lower energy consumption at the municipality level
 - ❑ the mitigation of GHG emissions,
 - ❑ its economic costs and
 - ❑ other additional co-benefits

- ❑ This set of quantitatively determined information provides a solid numerical basis to characterize the multiple benefits associated with this type of energy project.

Measurement in the MRV system

- ❑ Plan for the measurement stage:
 - ❑ what should be measured,
 - ❑ who will do it, and
 - ❑ how the measurements will be taken

- ❑ The quantitative information (measurement) to be collected as part of the MRV system in these cases will include:
 - ❑ Quantitative financial metric
 - ❑ Quantitative process metric
 - ❑ Quantitative technical metric

Measurement in the MRV system

Examples of Metrics used in an MRV system for EE projects

Financial metrics	Process metrics	Quantitative Technical metrics
Loans granted at a differential rate for EE projects versus expected	Number of efficient pieces of equipment installed in the sector versus expected	KWh * / y, saved in public buildings implemented and verified versus expected
Public funds spent on energy audits versus number of energy audits completed	Number of energy audits completed and documented by the public sector	USD / y, saved in public buildings implemented and verified versus expected
Public funds spent on refurbishment of public buildings versus funds available for refurbishment in the public sector	Number of proposed Energy Conservation Measures (ECM) versus ECM effectively implemented	GHG / y, saved in public buildings through ECM implemented and verified versus expected
Office building refurbishment cost per square meter	Number of Certified and Professional Verification Measurements in the Country	Investment versus GHG saved

Measurement in the MRV system

Source of methodologies to estimate the mitigation of GHG emissions

– Clean Development Mechanism Methodology Notebook (UNFCCC, 2019).

- a) AM0020: Baseline / Monitoring methodology for water pumping efficiency improvements (Baseline / Monitoring methodology for water extraction efficiency improvements)
- b) AMS-II.L: Demand-side activities for efficient outdoor and street lighting technologies (Activities of the demand - side technologies for efficient lighting outside and vial)
- c.1) AM0091: Large-scale EE technologies and fuel switching in new and existing buildings in (Technology EE large scale and fuel switching in new and existing buildings)
- c.2) AMS-II.E: Small-scale EE and fuel switching measures for buildings . (Small-scale EE and fuel change for buildings)

Measurement in the MRV system

Characterization of the projects

Type of projects	Energy aspects	Reference parameters	Measurement parameters
a) Water distribution of a pumping system, whose energy demand is lower due to the reduction of losses and leaks in the pumping system and / or implementation measures to increase the EE	Switch to a more energy efficient technology / measure	<ul style="list-style-type: none"> • Volume of water supplied by the project in the reference period • Electric energy required to supply water within the borders of the system in the reference period • Grid emission factor 	<ul style="list-style-type: none"> • Volume of water supplied by the project • Electric energy required to supply water within the borders of the system • Pumping equipment and system efficiencies • Annual operating hours • Grid emission factor
b) Efficient lighting replaces less efficient lighting, thus reducing electricity consumption and GHG emissions	Replacement of less efficient lighting with more efficient technology	<ul style="list-style-type: none"> • Reference period of annual operating hours • Reference period of the average energy of the project team • Number of luminaires in the project 	<ul style="list-style-type: none"> • Annual operating hours • Average energy of the project team • Number of project luminaires, placed in service and operating by virtue of the project activity

Measurement in the MRV system

Characterization of the projects

Type of projects	Energy aspects	Reference parameters	Measurement parameters
c1) Energy efficient units of project buildings that result in lower emissions due to lower consumption of fuel, electricity and hot / cold water	Electricity and / or fuel savings through EE upgrade. Use less carbon intensive fuel.	<ul style="list-style-type: none"> • Historical average of the retail price of the most commonly used fuel in the building units benchmark • Fuel emission factors used in reference buildings • Electricity and fuel bills 	<ul style="list-style-type: none"> • Fuel consumption, quantity and energy content of hot / cold water consumed and electricity consumption in project buildings • Total number of efficient artifacts of each type, used in CDM projects registered in the host country • Total surface area of the project buildings • Conditions and efficiencies of the design and operation of the individual equipment / appliance • Emission factors and calorific values of fuels
c2) EE and fuel change measures for buildings. Use of more efficient and / or less carbon-intensive equipment in buildings.	Electricity and / or fuel savings through EE upgrade. Optionally less carbon intensive fuel use	<ul style="list-style-type: none"> • Energy use in buildings before project implementation • If consumed from the electricity grid: emission factor from the grid 	<ul style="list-style-type: none"> • Specifications of the equipment replaced or reconditioned • Energy use of buildings after project implementation

Reporting in the MRV system

Contents of a report

- ☐ A description of the organization of information presented in the report, including sources and institutional organization used to obtain it, and the legal frameworks that allow this information to be collected from its sources;
- ☐ A description of the technical approach used to obtain the information and related calculations;
- ☐ A description of how the quality of the information used in the report was verified.

Verification in the MRV system

- ❑ External reviews of the information obtained through the implementation of the mitigation measure. It mainly consists of two elements:
 - ❑ The participation of third parties to carry out the verification stage (external technical experts who are not involved in generating the data or preparing the report);
 - ❑ The definition and application of the verification provisions through the use of review procedures such as checklists and cross-checking of data and information.
- ❑ Unlike other project families, in energy-related projects, there is a range of opportunities available to perform High Quality Verification

Organization of information in the MRV system

MRV for projects that install energy efficient road lighting systems

MRV	What	Who	How	When	Observations
Measurement	Data: Electric Energy Consumption of lighting systems in Kwh	Local government, which compiles data from the municipalities	Considering the installed capacity of the lighting projects installed in an operation	Annual basis	Establish a protocol, between the local government and the municipalities, for the delivery of information
	Data: types of luminaires in the improved lighting system, related to electrical energy and their effective hours of operation				
	Data: Emission factor of the National Electric System in tCO ₂ / MWh.			Annual basis	National authority
	Additional calculations: * GHG emissions avoided, corresponding to each year of operation of the most efficient lighting system	local government	Using the CDM methodology and spreadsheet	Annual basis	n / a

Organization of information in the MRV system

MRV for projects that install energy efficient road lighting systems

MRV	What	Who	How	When	Observations
Report	* Report annual data on the results of municipal mitigation actions	local government	Preparation of the report from a standardized matrix	Annual basis	n / a
	* Periodic report of the municipalities on mitigation actions within the framework of their PEACC	local government	Preparation of periodic update report	Periodically	Identify the update frequency
Verification	Verification report of the results reported with the measure	Third part, as designated by the national environmental authority	Application of the checklist	Annual basis, once the report is received for verification	n / a



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Conclusions

- ❑ Using an MRV system in the project will enhance its robustness and highlight the related savings in terms of avoided energy consumption and GHG emission mitigation.
- ❑ It will also serve to identify how a project is progressing and if there are problems and take corrective action as part of a continuous improvement process.
- ❑ Projects operating with MRV support are expected to be evaluated on a regular basis, and improve in time through adequate monitoring.



Thank you for your attention

c2e2.unepdtu.org

ffar@dtu.dk