



UNDERSTANDING NET BENEFITS AND COST FOR DIFFERENT ENERGY EFFICIENT REFRIGERATION DESIGN OPTIONS

SUPPORTING MANUFACTURERS WITH NEW METHODOLOGY AND TOOLS TO UNDERSTAND NET BENEFITS AND COST FOR DIFFERENT ENERGY EFFICIENT REFRIGERATION DESIGN OPTIONS AND THE REQUIRED MANUFACTURING LINE UPGRADES

For many years, UNIDO has supported Member States in phasing-out the use of ozone depleting and global warming substances in the cooling sector. The amendment to the Montreal Protocol in 2016 led to the creation of the Kigali Cooling Efficiency Program (K-CEP) which aims to help increase energy efficiency of cooling in developing countries. This approach is part of the unique K-CEP funded project “Assessment of incremental capital and operating costs for improved EE in domestic, commercial and retail refrigeration. Read more at <https://www.k-cep.org/>

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PROJECT GOALS & STEPS:

Are you a refrigerator manufacturer seeking to improve energy efficiency (**EE**) and reduce greenhouse gas emissions (**GHG**) in your facilities and products?

Then follow these **5 steps** to ascertain which changes you can cost-effectively take and be competitive in your own markets.



I Check your potential energy efficiency gains

Download this new study which sets out a methodology and tools for manufacturers to understand net benefits and cost for different energy efficient refrigeration design options and the required manufacturing line upgrades.

- Estimate your Manufacturer Development Index (**MDI**) and use it to evaluate typical incremental capital and operating costs involved with different energy efficiency upgrades and understand opportunities and market barriers for higher **EE** products;
- From the study, you will be guided to analyze incremental capital and operating costs for improved **EE** in domestic and commercial refrigeration and the associated emission reduction calculation;
- And finally, you can re-calculate, visualise and verify new designs using built-in software features.

Full study document can be obtained here: <https://www.unido.org/cera>

II Download the tool

In order to help manufacturers calculate their own net benefits and costs more easily, a free software tool, named Commercial EPA Refrigeration Analysis (**CERA**), has been adopted by **UNIDO** in collaboration with Omar Abdelaziz Ph.D. in order to allow manufacturers run their



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own simulations and use their own data. **UNIDO** is currently working with Omar Abdelaziz Ph.D. to develop an open source version of the model to enable future upgrades.

Once the software tool is downloaded and own data inserted, manufacturers are able to ascertain which changes to their product offerings can be incorporated cost effectively.



III Learn how to gain net benefits

Once manufacturers have assessed their potential designs, they can perform a technical and financial evaluation of options for enhancing **EE** in new models including any impact on production lines.



“Many companies in Article 5 countries are missing suitable guidance and opportunities for knowledge transfer when trying to meet global climate goals. This guidance document introduces practical ways to calculate and cost the changes needed for their product and factory footprint to comply with either international agreements or national legislation” **Mr. Fukuya Iino, Ph.D.**, Department of Environment UNIDO, Vienna, Austria

IV Make the simulation

Before starting the simulation, manufacturers need to gather technical data from within their company, preferably in Excel spreadsheets for ease of version control and tracking. The main data required is:

- cabinet design (configuration, overall dimensions, insulation thickness and properties for the different parts, inner and outer cladding thickness and thermal conductivity, door configuration);
- system controls and defrost technology;
- anti-sweat loop technology and heat dissipation;
- sealed system information (compressor map, evaporator design, condenser design, suction line heat exchanger).



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As soon as all the data have been gathered, the process of simulation can start, this may take 3-4 hours to input the data correctly and ensure validation of the model against measured performance. It is recommended that a team of engineers and/or modelling experts in the company perform the simulation and assess the results. At the end of the process, the simulation gives visual modelling of the changes in components, the benefit in energy efficiency and the cost involved in doing so.



V Assess the benefits of change

Once the simulation is finalised, a record of the changes made, developed scenarios and costings can be downloaded in different formats, including:

- excel worksheet showing manufacturing cost premium versus efficiency;
- tabulated performance gain versus different technology options.

These are fact-based recommendations into how to analyse changes in manufacturing, evaluate technical and financial options for **EE** products and calculate associated emission reductions.

The insights and technical recommendations resulting from the simulation process will provide a solid and accurate basis for discussions within the manufacturer company, between its engineers, strategic leaders, marketers, production and financial units, and the management.



“We hope manufacturers and service providers that need help to change their products and factories in today’s competitive marketplace can rely on the project guidance document and consultants familiar with the work to improve products energy efficiency and reduce emissions.” Study lead author **Omar Abdelaziz, Ph.D.**, Member ASHRAE, Assistant Professor of Thermofluids at Zewail City of Science and Technology



Manufacturers are now well equipped to start the simulation in their own manufacturing processes.

Here below is further information on what to find where:

Accessing the tool:

Download free of charge the Commercial EPA Refrigeration Analysis (**CERA**) at www.unido.org/cera

- Software compatible with most Windows PCs with 512 MBs space, available in English US, from **UNIDO**, under MIT License
- Updates will be made periodically and users will be notified by email for future downloads
- Fee-based technical assistance contact: Omar Abdelaziz Ph.D, omar.abdel.aziz@gmail.com, Tel: +1-865-387-0725, +20-102-348-3199

Data privacy note

Users retain ownership of their data used in the software. Download can be to local drives to maintain security.

UNIDO is not responsible for any data breach caused by the misuse of the software or the use of the individual company results from the simulation.



FREE



NEED FURTHER ASSISTANCE?

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TESTIMONIALS

“The guidance is insightful and has given us direction moving forward. GETS is interested in further training workshops and webinars”. [GETS, \(Uganda\)](#)

“The recommendations in the report are very useful”. [LEMATIC, \(Lebanon\)](#)

“We are evaluating the software and looking for support to increase our engineering capacity”. [FOGEL, \(Guatemala\)](#)

“We are exploring the suggested actions with emphasis to improve the energy efficiency of our systems”. [INDURAMA, \(Ecuador\)](#)