streamSAVE Dialogue Groups

Priority Actions:

- Accelerated replacement of inefficient electric motors
- Modal shift for freight transport

Minutes of Meeting 1

Tuesday 24 May 2022

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Short summary

This meeting discussed calculation methodologies and related issues about energy savings from (1) Accelerated replacement of inefficient electric motors, and (2) Modal shift for freight transport. Key points highlighted in the discussions:

About Accelerated replacement of inefficient electric motors:

- Harmonised data about the number of running hours and load factors are more difficult to source (while efficiency values are standardised). US studies provide more recent data than what is available from European studies, and could be used until more recent European data become available.
- One challenge about accelerated replacement is to determine how many years before the end of lifetime the motor is replaced. This is important when assessing 'additional energy savings' as defined in Article 7 EED.
- An alternative to indicative values is to use data monitored for the actions reported or a sample of actions. But default assumptions might still be needed about the replaced motors, when the information is no longer available (e.g., about its efficiency).
- Whenever possible, this is more accurate to use 'real-life' data instead of default or standard values. However, in practice, it is not always possible to get data specific to each project, depending on the context. For example, when assessing the energy savings at EU level, deemed savings are a pragmatic approach.
- A full optimization (including about the installed power) requires a whole system approach that is not yet always possible in practice. Information, capacity building and incentives are needed to make Minimum Energy Performance Standards fully effective and to tap the savings potential on the 'motor system level'.

About Modal shift for freight transport:

- Impossible to define standardised values at EU level for this action type. Only France has standardised methods for freight transport. Other countries report energy savings from freight transport, but not using deemed savings.
- Therefore the streamSAVE methodology provides a calculation of the theoretical potential for modal shift per Member State. Key parameters include the types of goods, categories of distances, and rail network density.
- The rail network density can be a limiting factor, meaning that a realistic assumption is that the freight volume could be at maximum doubled by 2030 (at EU level).
- One challenge is that freight can be both, national and international. Whereas only savings achieved within the Member State can be reported to the EED (both, Art.3 and Art.7). Assumptions might thus be needed to estimate the share of distances travelled on national terrirtory and abroad.
- The calculations of the differences in energy consumption between the two modes (road and rail) should take into account the differences in distances and weight for each mode.
- The savings lifetime assumed in the calculations is often shorter than the technical lifetime of the transport modules.
- Market data from professional organisations can provide indicative values for typical consumption per km (per mode), distances travelled (in the country and abroad) and operational lifetime (that can be used as proxy for the savings lifetime).

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(All times are in CEST)

GA N°890147

Part 1: Accelerated replacement of inefficient electric motors

Overview on methodology, formula and highlighting the difficulties & challenges regarding indicative values, by João Fong (ISR-UC)

(*See presentation file available on the streamSAVE Knowledge and support facility*)

João Fong clarified the scope of the Priority Action that is focused on the replacement of old inefficient electric motors before their end-of-life, in industry and services. It deals with 3-phase motors as defined in the Ecodesign Regulation 2019/1781, in the range of nominal power between 0.75 and 1000 kW (excluding the 'small' and 'large' motors).

The main calculation parameters include the efficiency of the replaced and new motors, the nominal power, load factor and duration of use.

The difficulties lie in the data collection, and in finding data sources to define indicative values for some of the parameters. While efficiency values are standardised, the number of running hours and load factors are more difficult to source.

Defining the lifetime of savings is also a difficulty, as it is important for this Priority Action to determine how many years before the end of lifetime the motor is replaced.

A specific issue is indeed related to additionality, and what share of the energy savings is to be related to the Ecodesign regulation (and thereby not eligible to Article 7).

About running hours, whereas old studies assumed that the running hours increased with the nominal power, a more recent study (in the US) found that the running hours did not significantly vary according to the nominal power.

The same study found that the load factor has increased compared to the results from studies done in previous decades.

Existing methodologies found in 9 countries and from the EMEEES and multEE projects.

These methodologies usually provide savings ratio for the installation of VSD and some of them also provide indicative values for specific motor system applications. Methods with indicative values were found in Austria, France, Luxembourg and Slovenia. The others rely on project data (measured).

Other sources include:

- EuP (Energy-using Products) motors preparatory studies (Lot 11 and Lot 30): https://www.eup-network.de/product-groups/preparatory-studies/completed/
- Ecodesign Impact Assessment related to the Ecodesign Regulation 2019/1781 for electric motors and variable speed drives: https://www.vhk.nl/downloads/Reports/2019/IA_report-swd_2019_0343.pdf
- US DoE (Department of Energy) Motor System Market Assessment (2021) Field assessment of motors in the US: https://www.osti.gov/biblio/1760267

An alternative approach (to using indicative values) is to use data monitored for the actions reported or a sample of actions. In that case, default assumptions might be needed about the replaced motors (when the information is no longer available; e.g., about its efficiency).

Q&A

- *Are the values from the US valid for Europe?*

Unfortunately, there is no similar recent study to provide updated values from Europe.

No particular reason why there would be major differences between the US and Europe.

- *Could you elaborate about the issue of additionality vs. the ecodesign regulation?*

The minimum efficiency required corresponds to the IE3 standard. Therefore the new motor should have a better efficiency than IE3, which is usually easy to monitor. What is more challenging is to assess when the motor would have been replaced in the absence of the policy measure, to estimate the duration of early replacement (for which the baseline can be the replaced motor).

The lack of availability of up-to-date data and the contributions of regulations and incentive schemes to the promotion of energy efficient motor technologies were also discussed.

Electric motor systems detailed in Dutch energy savings policy, by Maarten van Werkhoven (TPA adviseurs, the Netherlands)

(*See presentation file available on the streamSAVE Knowledge and support facility*)

Maarten van Werkhoven briefly provided an overview of the Dutch energy and climate policies, before presenting more in details the Pilot Audit program for Electric Motor Driven Systems (EMDS).

This pilot program done over 2019-2021 was designed to test an approach on 30 audits that could then be disseminated to the Dutch industry. It was meant to show to industries the added value of doing such an audit, and also that there were ESCos (Energy Services Companies) able to deliver good quality audits.

The process in four steps is based on EMSA's 'Audit Guide EMDS' and the energy audit standard ISO 50002. Moreover, the scheme provided the auditors with special tools so that they can make calculations independent from the motor manufacturers. These tools were based on IEC standards and research data. The scheme also defined a template for the audit report.

At the end of the pilot phase, 25 audits were completed, covering a large variety of industrial branches and ranges of company size / energy consumption per industrial site (but with more audits in large and energy intensive companies).

The total electricity use in the scope of the 25 audits amounted to 473 GWh, whose 203 GWh (i.e. 43%) for motor systems. The savings potential identified amounted to 24.1 GWh, i.e. 12% of the initial consumption of the motor systems. This could save about 1.42 million euros per year for a total investment of 4.26 million euros, meaning a payback time of 3 years. This would also save about 13.4 $ktCO_2$/year.

In many cases, the initial energy monitoring (before the audit) was rather poor. Improving the energy monitoring of the motors was thus often a first step towards a systematic processing of energy data through the introduction of an energy management system.

The pilot scheme also showed that the market for energy audits of electric motors was imperfect, with a low demand from the industry companies (e.g., due to limited time to consider this topic) and a low supply from the ESCo side (also with the need to develop more system analysis beyond the focus on analysis per component). Other issues include the limited data availability (cf. poor initial energy monitoring, but also about the devices / assets).

At the same time, the results from the pilot audits confirmed an interesting savings potential that could be achieved on short term.

The recent regulatory measure on companies (energy savings obligation) require them to implement energy efficiency actions with a payback time shorter than five years, which could be a driver to tap the savings potential identified in the pilot scheme (and beyond). Especially because actions on electric motors are listed as part of the cost-effective actions (i.e. with a payback time shorter than five years).

Another policy change is that the long-term agreements (LTAs) in place in the Netherlands since the 1990's have been terminated by the end of 2020. This makes that the companies that were part of the LTAs are no longer exempted of the energy savings obligation. And this obligation also implies that they have to do a mandatory energy savings analysis (audit) every four years (in line with the current Article 8 of the EED). Which should drive the demand for energy audits, and further to implement energy management systems.

As part of this process, the companies covered by this obligation have to report what actions they have implemented in the last three years, and what actions they plan to implement in the coming years. More specifically about electric motors, the energy savings analysis has to provide and then update an inventory of the motor driven systems in use (for motors larger than 15 kW and used at least 3000 hours per year) and the related savings potential, together with a maintenance and replacement strategy.

The regulation provides a list of characteristics to be examined periodically (to ensure a systematic analysis of the savings potential).

Q&A with Rita Werle

- *About the point on monitoring, does it mean that the energy savings could be assessed specifically to each case?*

Yes, in the assessment of the business cases, measurements have been made, on system level.

- *At the same time, the point on limited data availability would argue in favour of using standardised assumptions / deemed savings?*

The pilot programme was a great opportunity to gather data and be able to use 'real-life' data. Whenever possible, it is more appropriate to use 'real-life' data instead of default or standard values. However, in practice, it is not always possible to get data specific to each

project, depending on the context. For example, when assessing the energy savings at EU level, deemed savings are a pragmatic approach.

- *Any insights about installed power savings? are these relevant?*

An average saving of 12% is an indicator that in a number of cases a system optimization was not in the scope, meaning that the installed power was not always optimized. However, among the identified measures, correct sizing of the equipment has been applied; on business case level, savings of 30 to 70% are reported.

- *Would you say that for electric motors, régulations can be more effective than information or incentives to get inefficient motors replaced?*

Regulations setting Minimum Energy Performance Standards are step 1 and absolutely necessary. They should go hand in hand with information, capacity building and incentives, to be fully effective and to tap the savings potential on the 'motor system level' .

Part 2: Modal shift for freight transport

First insight in the saving potential analysis for modal shift in freight transport from road to rail, by Elisabeth Böck (AEA)

(*See presentation file available on the streamSAVE Knowledge and support facility*)

Elisabeth Böck clarified that it would be impossible to define standardised values at EU level for this action type.

Instead, the methodology provides a calculation of the theoretical potential for modal shift per Member State. The calculation distinguishes the types of goods and categories of distances, that are essential parameters in the calculation.

The calculation also takes into account the rail network density, which led to the assumption that the freight volume per Member State could be at maximum doubled by 2030.

The energy savings are derived by considering the difference in energy consumption per transport mode, and the parameters previously mentioned (cf. factors for types of goods, distance classes, network density).

One challenge is that freight transport can be both, national and international, whereas only savings achieved within the country can be reported to the EED (both, Art.3 and Art.7). This led to assuming that the first tank filling would correspond to the country territory, while in case of second tank filling, this would be considered part of another country. This is handled in the calculation by adding a special factor about long distance transportation.

The methodology will not provide an assessment of economic feasibility, as this would differ too much according to the countries. However, indicative cost data will be included.

Q&A

- *Could you find examples of methods that would be used by Member States about this action type?*

Only France has standardised methods for freight transport (no other standardised method found in other countries). However, other countries report energy savings from freight transport, but not using deemed savings.

- *You said that only energy savings realized on national territory are eligible? What about a road-rail shift where we have 50% of the way in a country A and 50% of the way in the country B. The trucks would tank only in country A but the train consumes 50% electricity in country A and 50% in country B. So how to calculate the eligible saving for country A?*

The energy savings happen due to reduced tank fillings which are substituted by more efficient transport via rail. In the methodology, it is assumed that a freight transport vehicle would start its trip with a fully filled tank. Taking into account maximum tank sizes and the energy consumption of freight vehicles, around 2000 km can be covered with one tank filling. For distances higher than this, only part of the distance travelled is accounted for in both transport modes.

Calculation methods about modal shift for freight transport – Examples from the French white certificates scheme, by Caroline Meunier (Total Energies, France)

(*See presentation file available on the streamSAVE Knowledge and support facility*)

Caroline Meunier reminded that the French white certificates scheme is the single measure reported by France for Art.7 EED, and was assessed to deliver about 40% of the reductions in GHG emissions achieved by France over 2015-2018.

The scheme started its fifth period in January 2022 (the first period started in July 2006). The targets have increased significantly over time, and could further increase in line with the European ambitions (cf. fit-for-55 package).

There are three main ways to get white certificates. This presentation is focused on the approach of standardised actions.

The definition and technical specifications (including the savings calculations) of these standardised actions are developed by working groups organised per sector (or even sub-sector when relevant), with regular meetings. The working groups are coordinated by ATEE (association gathering most of the stakeholders involved in energy efficiency, and especially the obligated parties and stakeholders active in the white certificates scheme).

The factsheets are proposed by the working groups, and then reviewed by ADEME and the Ministry for Ecological Transition, the Ministry having the final word to approve them or not. Once approved, the synthesis and explanatory factsheets are public, but not the detailed factsheets including the details of the calculations. These detailed factsheets are available only to the working group members, ADEME and the ministry (which provides an incentive for stakeholders to be members of the working groups).

There are also general methodological factsheets per sector (also with access restricted to the working group members). These methodological factsheets list the main sources of

data used for each sector, and the main variables to be considered. In most cases, the main sources are based on updated and official data.

Then a detailed factsheet is prepared for each action type that will then be listed in the catalogue of standardised actions. This detailed factsheet includes all the details and data of the corresponding standardised calculation method.

The standardised methods have three main items: operation lifetime, annual savings and cumulative savings (over the discounted lifetime).

The presentation was then focused on two action types, first modal shift "swap body or gripper semi-trailer" (reference TRA-EQ-101 in the catalogue), and second "rail highway wagon" (reference TRA-EQ-108 in the catalogue).

About the "swap body or gripper semi-trailer", the complete name of the action is "acquisition (purchase or rental) of a new intermodal transport unit (ITU) (swap body or clamp trailer) dedicated to combined rail-road transport". The calculations takes into account all the differences between the two transport options: in distances (mileage) (usually shorter by train) and in weight (usually heavier for rail).

Values are distinguished according to two main categories of swap bodies (based on the size of the unit, i.e. length smaller or bigger than 9 meters). The data monitored for each action reported to the scheme include the identification of the vehicles and the number of travels. The technical lifetime of the action is assumed to be 12 years (conservative assumption).

About rail-highway wagon, the full name of the action is "purchase or rental of a new rail-highway wagon for the transport of semi-trailers between two transhipment terminals, at least one of which is located in metropolitan France". The calculation also requires to report the distances travelled (in addition to the number of travels). Standard distances are set for the typical journeys between transhipment terminals.

Q&A

- *You mentioned an abatement coefficient of 15% for the distances travelled abroad (outside France). Is it the same independently of the country from departure or arrival?*

Yes, it is a standard values applied whatever the countries of departure/arrival. As mentioned in the previous presentation, only the energy savings from travels within the country are eligible. So normally, the starting and ending points for the calculations should be in France. However if the actual departure or arrival are outside France, then 15% is the default value for abroad distance.

- *How do you define the lifetime of savings for methodologies targeting modal shift? Such actions are not investive per se, but rather a change in operation which could be changed again quite quickly?*

The lifetime is based on average market data (from the federal organisation; action 1), or fiscal lifetime (capital allowance / amortization period) (action 2).

- *Was the ecotransit website developed specifically for the white certificates scheme?*

No, it was developed by the professional organization (Groupement National du Transport Combiné) that provided most of the market data used in the standardized methods defined for freight transport.

- *How is the calculation to end up at a lifetime factor of 9.76 by taking into account a technical lifetime of 12 years?*

The unit for white certificates is lifetime-cumulated and discounted savings, in kWh cumac ("cum" standing for "lifetime-cumulated" and "ac" for actualised/discounted). A standard discount rate of 4%/year is applied to all action types / energy savings. When applying this 4%/year discount rate to a lifetime of 12 years, this gives the so-called "discounted lifetime" of 9.76 years that is used to convert annual savings (in kWh/year) into lifetime-cumulated and discounted savings (in kWh cumac).

List of participants

24 participants

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