Dialogue meeting

2nd Cycle – 1st meeting on:

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

May 24, 2022

This project has received funding from the Horizon 2020 programme under grant agreement n°890147. The content of this presentation reflects only the author's view. The European Commission is not responsible for any use that may be made of the information it contains.

Welcome and Agenda

15.00 (CEST)	Introduction to the meeting
	PART 1: Accelerated replacement of inefficient electric motors
15.05	Overview on methodology, formula and highlighting the difficulties & challenges regarding indicative values, by **João Fong** (ISR-UC)
15.25	Electric motor systems detailed in Dutch energy savings policy, by **Maarten van Werkhoven** (TPA adviseurs, the Netherlands)
	PART 2: Modal shift for freight transport
15.50	First insight in the saving potential analysis for modal shift in freight transport from road to rail, by **Elisabeth Böck** (AEA)
16.10	Calculation methods about modal shift for freight transport–Examples from the French white certificates scheme, by **Caroline Meunier** (Total Energies, France)

Note: Discussions will be under Chatham House Rule: the minutes will not mention any name or country.
All discussion points included in the minutes will be anonymized.

PART 1: Accelerated replacement of inefficient electric motors

Priority Action ‘Anticipated motor replacement’

Overview on methodology, formula and highlighting the difficulties & challenges regarding indicative values

João Fong (ISR – University of Coimbra)

Dialogue Group Meeting, 24 May 2022

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PA#3 – Anticipated motor replacement

- Definition:
  - *Replacement of old inefficient electric motors before their end-of-life.*

- Scope:
  - **Sector:** Industry / Tertiary
  - 3-Phase Motors in the scope of The Ecodesign Regulation (EC Regulation 2019/1781)
    - Only between 0,75kW and 1000kW (exclude “small motors”)

PA#4 – Anticipated motor replacement

One methodology:

– *Article 7 =>*

$$\mathrm{TFES} = P_n \times N \times \left(\frac{1}{\eta_c} - \frac{1}{\eta_{he}}\right) \times LF \times 100$$

TFES	Total final energy savings [kWh/a]
P_n	Nominal power as indicated in the nameplate (kW)
N	Annual working hours
η_c	Efficiency of conventional motor (%)
η_{he}	Efficiency of high-efficiency motor (%)
LF	Load factor

– *Article 3 =>*

$$\mathrm{APES} = TFES \times PEF_{Electricity}$$

APES	Annual primary energy savings [kWh/a]
TFES	Total final energy savings [kWh/a]
$PEF_{Electricity}$	Primary Energy Factor for electricity [dmnl]

– *Greenhouse gas savings =>*

$$GHGSAV = TFES \times f_{GHG,electricity} \times 10^{-6}$$

GHGSAV	Greenhouse gas savings [t CO_2 p.a.]
TFES	Total final energy savings [kWh/a]
$f_{GHG,electricity}$	Emission factor for electricity [g CO_2/kWh]

PA#4 – Anticipated motor replacement

- Main difficulties:
  - data sources for the “indicative values for savings”:
    - Efficiencies are standardized
    - Up-to-date average values for the number of running hours and load factor may be difficult to source.
  - definition of the lifetime of savings;
- Additionality: Difficulty in assessing which savings are additional to Ecodesign

PA#4 – Anticipated motor replacement

- Some existing Methodologies (identified in Task 2.1) have indicative values (e.g. Austria, France, Luxembourg, Slovenia), others rely on project data (measured)
- Other sources include:
  - EuP motors studies (Lot 11 and Lot 30)
    - https://www.eup-network.de/product-groups/preparatory-studies/completed/
  - Ecodesign Impact Assessment
    - https://www.vhk.nl/downloads/Reports/2019/IA_report-swd_2019_0343.pdf
  - DoE Motor System Market Assessment (2021) Field assessment of motors in the US.
    - https://www.osti.gov/biblio/1760267

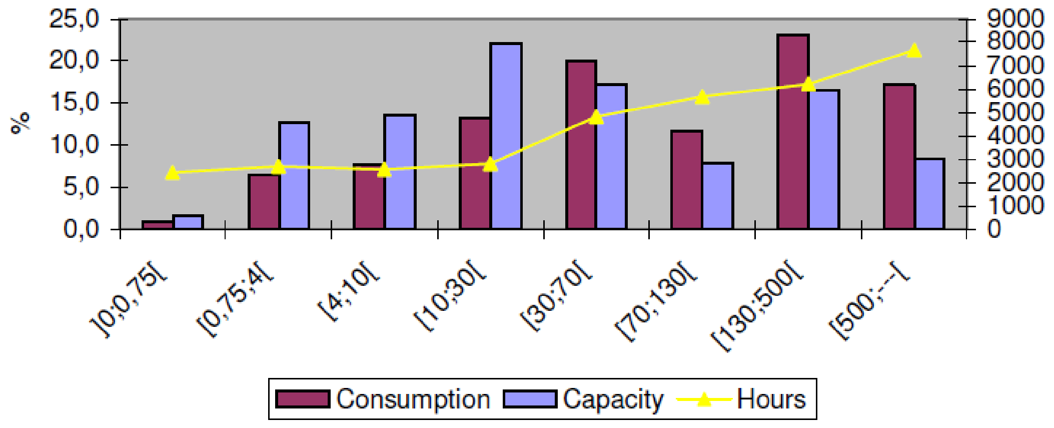
PA#4 – Anticipated motor replacement

- <u>Simplified approach:</u>
  - Use average indicative values for calculation of savings:

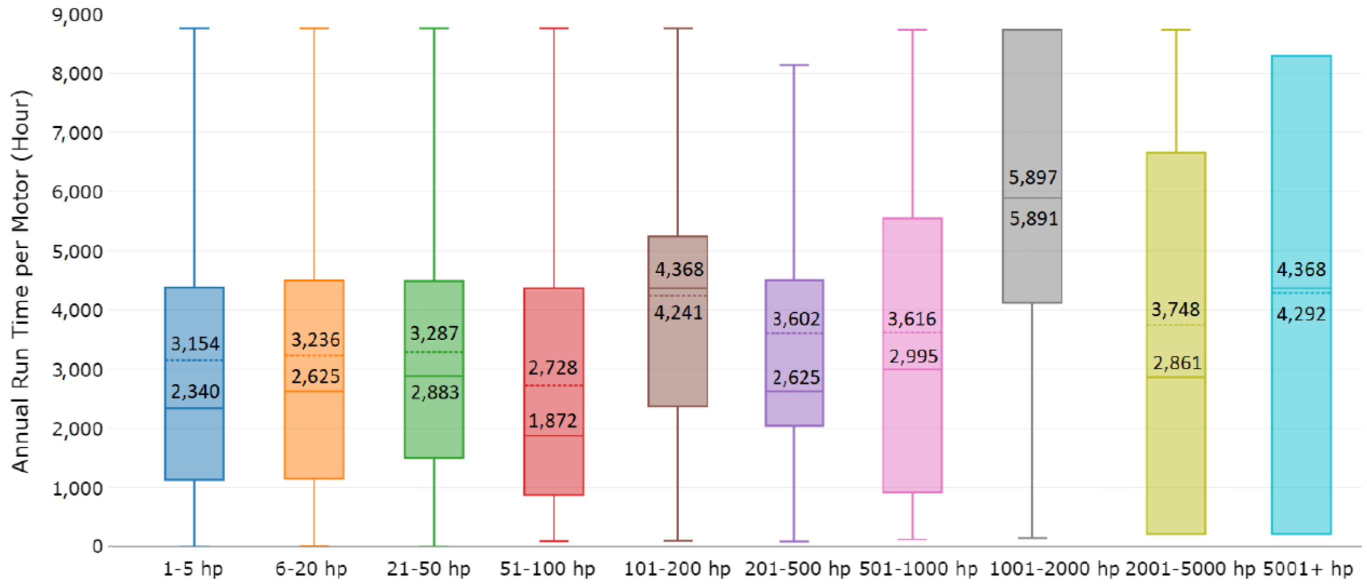
N	3000 hours
η_c	Average between IE1 and IE2 (%)
η_{he}	IE3 (%)
LF	0,6

PA#4 – Anticipated motor replacement

- Sources for average indicative values:
  - Annual running hours



Source: SAVE (2000)

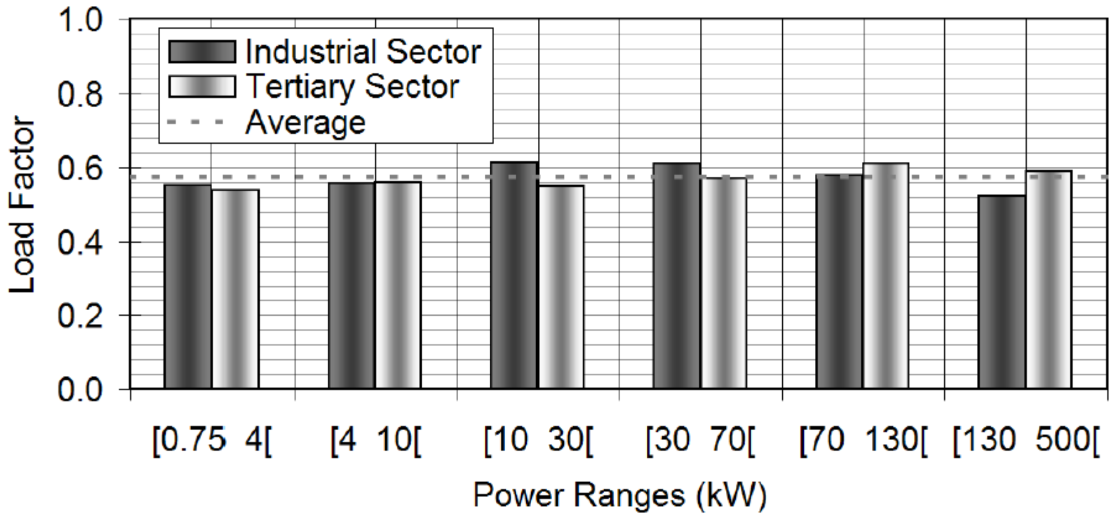


Source: US-MSMA 2021

The run hours do not vary significantly across size categories.

PA#4 – Anticipated motor replacement

- Sources for average indicative values:
  - Load Factor



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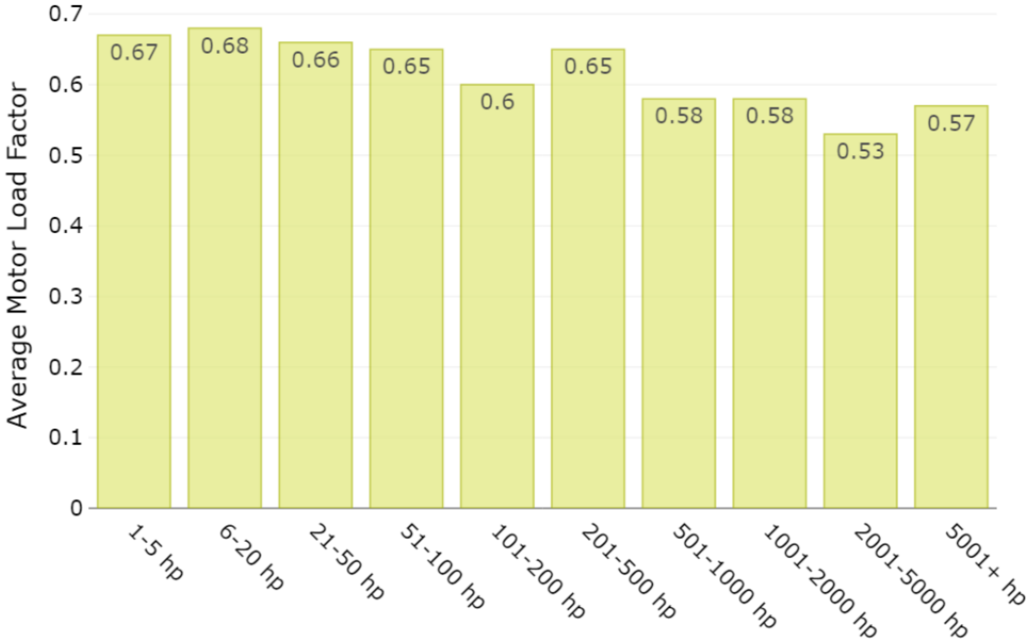
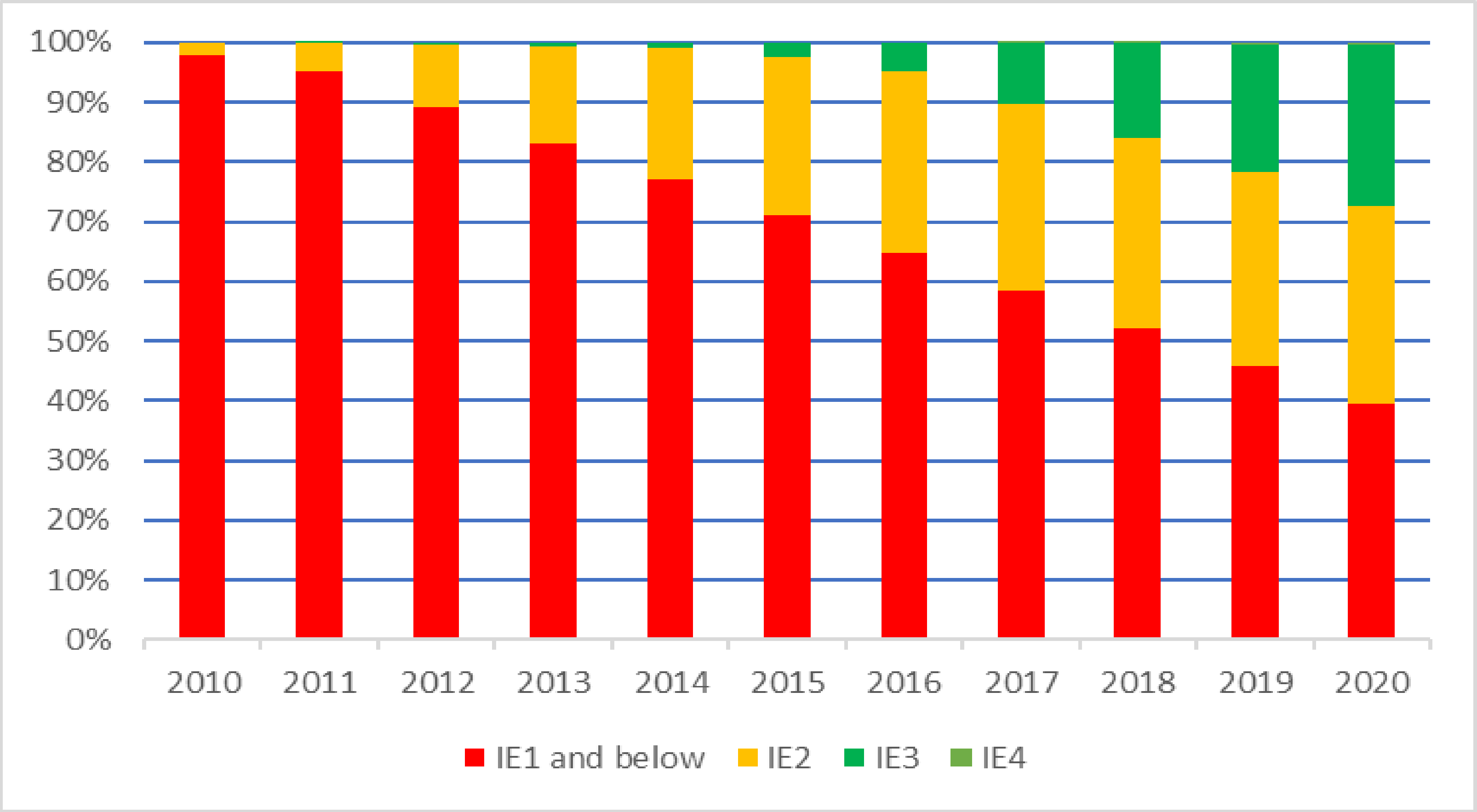


Source: US-MSMA 2021

PA#4 – Anticipated motor replacement

- <u>Sources for average indicative values:</u>
  - <u>Efficiency</u>



PA#4 – Anticipated motor replacement

- Advanced approach:
  - Use real, measured, values for the calculation of savings:

PA#4 – Anticipated motor replacement

- Advanced approach:
  - Annual running hours

  Use actual running hours or approximation:

Industry	1 shift, 5 days/week	1.920h
Industry	2 shifts, 5 days/week	3.840h
Industry	2 shifts, 6 days/week	4.608h
…		

PA#4 – Anticipated motor replacement

- Advanced approach:
  - Efficiency:

    Use actual efficiency as in nameplate of both old and new motor or approximation:

  - If old motor is over:
    - 15 years IE0
    - 10 years IE1
  - Use standardized efficiency for new motor: IE3 or IE4

PA#4 – Anticipated motor replacement

– For installation of VSD

End-Use	Average VSD Savings (%)
Pumps	28*
Fans	28
Air Compressors	12
Cooling compressors	12
Conveyors	12
Other Motors	12

PART 2: Modal shift for freight transport

Freight Transport

Modal shift potentials from road to rail per Member State

streamSAVE Dialogue Group Meeting, May 24, 2022

Elisabeth Böck (Austrian Energy Agency)

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Concept of the methodology

- No provision of savings achieved by a single action implemented, as impossible to define standardized values
- Instead: analysis of overall shift potential per Member State, to offer a first assessment of savings that can be achieved
- Option to enter the amount that will actually be shifted, either of total freight transport or a specific sector or distance class

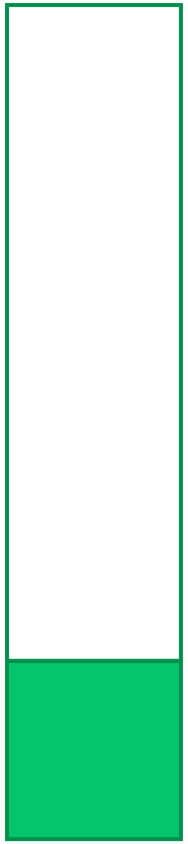
Calculation of the modal shift potential
Transport volume

Basis:

Road freight transport volume (tv)

- Per Member State
- Per type of good
- Per distance class

Calculation of the modal shift potential
Theoretical potential



$$tv * f_g * f_{dc}$$

Transport volume multiplied by:

- Factor for the modal shift potential per type of good (f_{dg})
  - Depends on usual packaging, potential for quick transfer, packing density
- Factor for the modal shift potential per distance class (f_{dc})
  - Longer transport distance are more reasonable to shift

Calculation of the modal shift potential Technical potential

$$tv * f_g * f_{dc} * f_{nd}$$

Takes into account the rail network density (f_{nd})

- Approach: freight transport volume on rail will at a maximum be doubled until 2030
- Comparison of current rail freight transport with theoretical potential (per Member State)
- Calculation of a factor for maximum technical potential

Calculation of final energy savings

$$TFES = tv * (FEC_{road} - FEC_{rail}) * f_g * f_{dc} * f_{nd} * f_{nt} * share$$

- Technical shift potential * difference in energy consumption per transport mode (FEC_{road} – FEC_{rail})
- For international freight transport:
  - Only savings achieved on national territory can be accounted
  - Take into account substituted tank fillings on national territory
  - Hypothesis: first tank filling happens at start of the cargo transport

→ factor f_{nt} for long distance transportation

Use & Limitations

- Member States can assess overall potential and enter a share to be shifted by actions implemented, either for:
  - The total shift potential
  - For a certain group of goods or distance class
- Economic feasibility is not considered in the methodology, but data on relevant cost components will be prepared

Next steps

Next steps

- Meeting minutes
  - please feel free to send us your suggestions, either in the online forum or to dialogues@streamsave.eu

  The minutes and presentation files will be available at:

  https://streamsave.flexx.camp/support-contribution-401

- All information will be included on the platform
  - in case you are not registered yet, we will show you how

- The discussions continue in the online forum
- Next meeting on 14 June on Energy poverty related EE measures (registration link)

Feedback

- Please, fill out our quick feedback survey

- You may also leave us a longer message
  - Via forum on the streamSAVE platform
  - Via the anonymous form (link in the chat)
  - Via dialogues@streamsave.eu
    - Please accept as sender

- To receive more info → register on the streamSAVE platform: https://streamsave.flexx.camp/signup-0818ml

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LGi
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Thank you

Get in touch for more information!

Project coordinator - Nele Renders, VITO

All project reports will be available for download on the streamSAVE website www.streamsave.eu

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