

International Energy Agency IEA
Implementing Agreement - Efficient Electrical End-Use Equipment 4E
Annex: Electric Motor Systems



New Motor Technologies (TASK G)

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Contents



- Introduction
- Facilitating the Policy Maker
- Scope of the New Motors Technology project (Task G)
- Project objectives
- Project approach

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Electric Motor Systems Annex (EMSA)



- 4E provides international forum for governments and other stakeholders to share expertise and develop understanding of electrical end use equipment and policies; and facilitate coordination of policies for efficient electrical equipment.
- EMSA Objectives: to build Global Motor Systems Network to stimulate knowledge, technology and policy in field of efficient motor systems. EMSA contribution will be in technical and policy advice, harmonization of standards and distribution of best practice experience.

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Task G – New Motor Technologies



The Task is about supporting the development of energy performance test and classification standards for ‘new motor technologies’

Participants

- UK (*Leading*)
- Australia
- Denmark
- Switzerland
- Other countries interested
- *Will also engage with other stakeholders*

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Objectives for Policy Makers



- To introduce effective policies & measures resulting in the reduction of energy consumption (& CO₂ emissions) by electric motor systems
 - Understand the market and associated savings potential
 - Minimise adverse economic impacts
 - Stimulate the market
 - Implement effective policies

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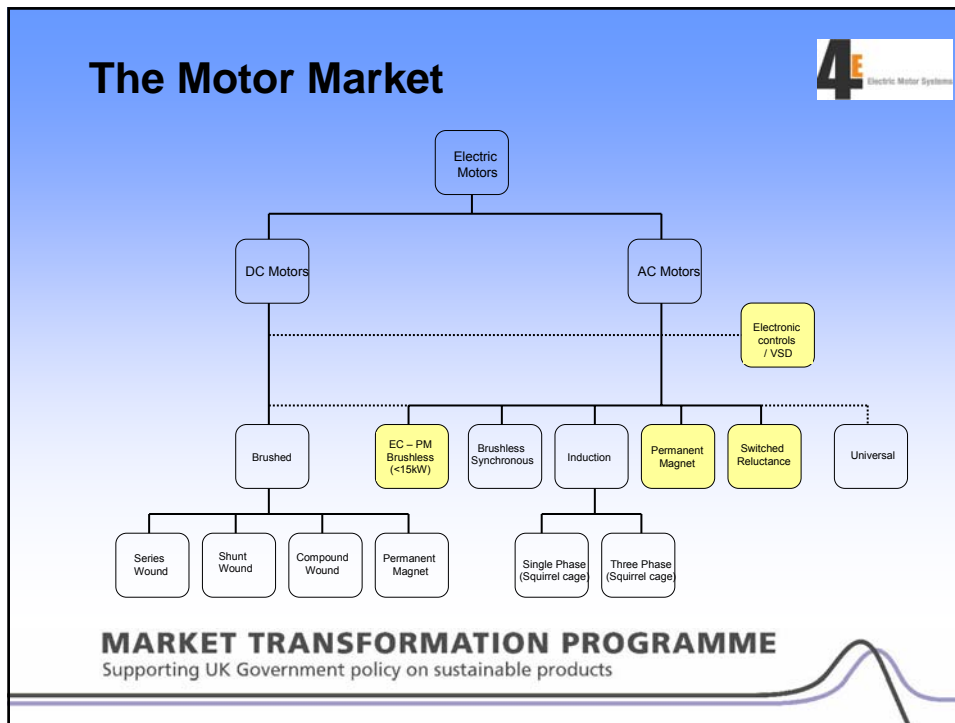
Supporting The Policy Maker



- Unambiguous product definitions
- Reliable test methods
 - Consistent across different test facilities
 - Understand acceptable tolerance limits
 - Standard reporting formats
 - Ensure compliance
- Methods to classify and rate performance
- Test methods and classification systems to align with policy framework

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Variable speed technology

- *At least 50% of motor applications could realise energy savings through variable speed control*
- Variable Speed Drives (VSDs) - control motor's output to match the speed / torque requirement of the load
- Precision control of speed and torque was domain of DC motors until 1980's
 - Expensive, high maintenance costs
 - Paper, steel industries and other applications requiring precision
- VSD with AC induction motor
 - Lower cost, improved reliability
 - Cost effective in energy saving applications – allowed entry into fan and pump markets

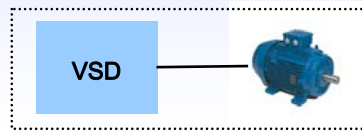
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AC Induction vs. Permanent Magnet



- Comparison between technology options

	AC Induction	AC Induction + VSD	Permanent Magnet
Function	Fixed speed operation only (E.g. 3000, 1500, 1000 & 750rpm on 50Hz supply)	Variable speed & torque	Variable speed & torque
Mains connection	Direct connection to mains supply	Connection to mains via VSD	Connection to mains via VSD
Size	0.5kW -> MW	0.5kW -> MW	0.5kW -< MW
Cost	\$ Low	\$ Med - High	\$ Med - High
Efficiency	med - high	< AC induction	> AC induction + VSD



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Electric Motor Test Standards



- Most electric motor test standards are based on, or are derivatives of

Energy Test Standards	Scope
IEC60034-2-1:2007	Induction Motors
EN / IEC 60034-2:1996	DC motors
IEC 61972:2002	Synchronous motors
IEEE 112 (2004)	Polyphase induction motors

- Controllers and peripheral components are excluded*

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Motor Performance Information



- Minimum Performance Requirements
 - Focus on AC induction motors
 - MEPS in many countries....
In Europe EuP Regulation effective June 2011
- Performance Information
 - Labels
 - Best in class
 - Focus on AC induction motors

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Gaps in performance information



- No test methods for VSDs (for any motor types)
 - In development: IEC 60034-2-3, '*Specific test methods for determining losses and efficiency of converter fed AC machines*'
- No performance classification data for VSDs
 - *Future EuP measures likely to require VSD performance information*

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Policy maker & other stakeholder requirements



- Ability to classify performance of VSDs
(As stand alone products, designed for AC induction motors)
 - As sales volumes increase so the need to rate performance also increases
 - Future EuP Requirement?

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Policy maker & other stakeholder requirements



- Ability to classify the performance of VSD/electronic controller + motor package (for any motor type)
 - So that we can compare across technologies, E.g. can we prove a PM package is more efficient than an AC induction motor package?

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Policy maker & other stakeholder requirements



- Ability to cross reference performance with stand alone motors
 - AC induction vs. Permanent Magnet vs. Switched Reluctance
- Confidence there is a low risk for amendments to standards once published

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Objectives

- To provide information and tools to assist the development of policy for electric motors and their controls
 - Encourage research in support of test methods and classification systems
 - Provide support to the development of test standards and classification standards
 - Learn and respond to lessons from previous standards work
 - E.g. EMSA Testing Centres (Task C) reviewing test standards for AC induction motors

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Scope

Initially

- Series produced 'General purpose' motors
- AC induction, permanent magnet, switched reluctance and similar technology motors.
- *And their controllers*
- With rated outputs 0.75kW – 375kW
- With rated input voltage $\leq 1000V$

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Task G – New Motor Technologies



Work plan

- Part 1 – Analysis of existing standards
 - Market trends, emerging technologies
 - Review test methods already available & latest developments
 - Gap analysis on test methods and performance information
 - **Compile list of issues for consideration in development of new standards**
 - **Stakeholder engagement**
- Workshop
 - Agree areas for further research
 - List of issues maintained as live document

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- Examples of issues that might be considered...
 - How to define a 'Standard motor' for VSD only test
 - What are the effects of different hardware and software configurations on energy performance?
 - Should comparisons be made based on duty points or on a duty profile?
 - How significant are standby losses?
 - Should tests include variations in supply voltage?

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Work plan

- Part 2 – Expand knowledge
 - Encourage laboratory testing and research
 - Test methods
 - Product combinations
 - Maintain dialogue with stakeholders

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Work plan

- Part 3 – Facilitating standards development
 - Facilitate a forum to discuss and agree standard methods of comparison between the significant different motor technologies
 - Maintain dialogue with stakeholders and contribute to the further development of test standards

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- Please join us
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