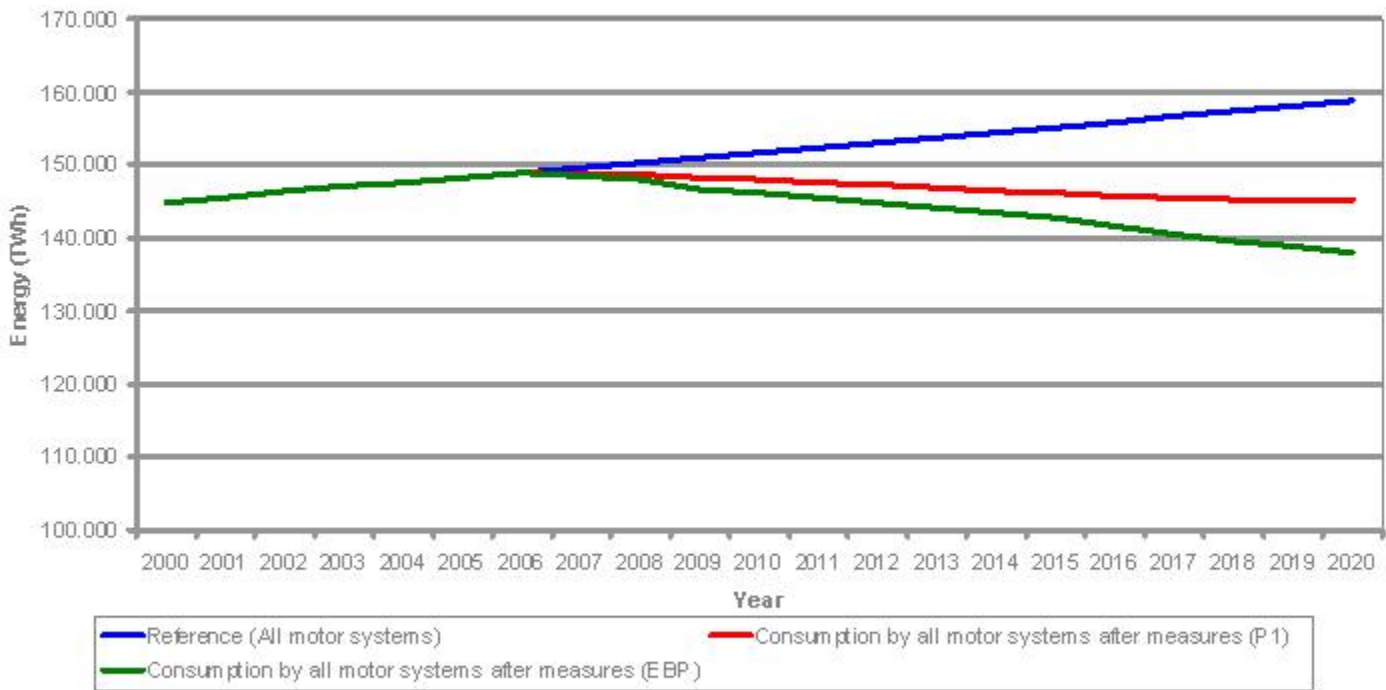




# Policy Brief > Motor Driven Systems > UK Energy Consumption of Industrial Electric Motor Systems

The scope of this policy brief is limited to Motor Driven Systems and the use of electric motors and certain associated equipment in industrial and commercial applications. This includes all electric motor types sized from 1.1kW through 400kW, Variable Speed Drives (VSDs), and the application of fans and pumps.

Energy Consumption, Motors, Fans and Pumps



It is estimated that over 11 million motors with a total capacity of 90GW are installed in UK industry. On an average industrial site, motor systems account for two thirds of the total electricity used and are responsible for about 40% of the UK's total electricity consumption. Motors are used in a wide variety of applications, dominated by fans (22% of industrial motor energy consumption) and pumps (32% of industrial motor energy consumption). Amongst others there is considerable scope to reduce carbon emissions through measures to improve motor efficiency, and measures to improve fan and pump 'system' efficiency.

**Key Policies:** To revise or replace the existing motor test standard (EN60034-2). To revise the existing CEMEP motor labelling scheme and uplift existing motor performance labels. To implement Minimum Efficiency Performance Standards (MEPS) for motors. Supply Chain Agreements (Fans and Pumps) - develop best practice behaviours to ensure fans & pumps systems are installed and operated efficiently.

**Issues:** The current EU/CEMEP motor labelling scheme is dated and cannot distinguish the latest generation of best in class motors available. The European motor test standard (EN60034-2) is insufficiently accurate and needs revision or replacing. In fan and pump systems their greatest energy saving potential may only be realised through addressing them at a 'system' level.



Scenario Type	2010	2020	Policy Cost
<b>Reference Scenario (Ref)</b> Shows underlying trends and implemented policies.	151.7 TWh (16.08MtC)	158.8 TWh (17.0MtC)	
<b>Policy Scenario (Pol)</b> Shows the impact of all proposed policy actions.	148.0 TWh (15.67MtC)	145.2 TWh (15.53MtC)	-
<b>Earliest Best Practice Scenario (EBP)</b> Shows the earliest possible take up of best practice.	146.2 TWh (15.5MtC)	138.1 TWh (14.77MtC)	

The Table above shows 'gross' figures for energy and carbon emissions, which apply to the performance of products when measured in isolation and ignore the consequence of installing them in heated buildings. Energy consuming products contribute warmth to the building and alleviate load on the heating system (known as the 'heat replacement effect'). Consequently, energy and carbon savings calculated from differences in 'gross' figures are not fully achievable (see BNXS05, BNXS24).

**This Policy Brief and referenced information is a public consultation document and will be used to inform Government decisions.** The information and analysis forms part of the evidence base created by Defra's Market Transformation Programme. The scenarios and action plans do not imply commitment by Government nor by any other body.



## 1. Current Situation

The motor stakeholders (CEMEP) are being engaged via MTP's support of the SEEEM initiative and associated activities. Both the fan and pump industries through their trade associations (FMA and BPMA) are engaged with MTP in developing respective energy strategies. Other stakeholders are being canvassed for their participation in their respective areas.

### Policy Risks

- MOTORS:
- The current EU/CEMEP motors labelling scheme was launched in 1999 and is no longer able to distinguish the latest generation of best in class motors starting to come onto the market.
- The uptake of high efficiency motors (EFF1) is thought to be around 15% and not expected to increase much further with existing policies.
- The current EU motor test standard (EN60034-2) is insufficiently accurate for comparison of motors in different markets.
- FANS & PUMPS:
- The greatest energy saving potential (up to 30%) within fan and pump systems is associated with improving the overall 'system' efficiency. In competitive markets consideration of overall system efficiency tends to be overlooked in the supply of fan and pump systems.

### Opportunities

- MOTORS:
- Revision of the EU/CEMEP motor labelling scheme is recommended in order to distinguish the latest generation of best in class motors and to provide future performance levels.
- Introduction of mandatory Minimum Energy Performance Standards (MEPS) for motors are recommended as the most effective means of uplifting the market.
- Revision or replacement of the EU motor test standard (EN60034-2) is recommended.
- FANS & PUMPS:
- Measures to address 'system' efficiency are recommended and these include initiatives associated with the supply chains. In addition training and other tools are required and overall awareness needs to be increased.
- Some products, especially those in the low cost high volume market may benefit from labelling.

### Recent Progress

- Enhanced Capital Allowances for electric motors and variable speed drives have been implemented.
- CEMEP are currently revising the existing motor test standard (EN60034-2) with a view to updating the motor labelling scheme.
- The fan and pump industries through their trade associations (FMA and BPMA) are engaged with MTP in developing their respective energy strategies.
- Part L of the Building Regulations is influencing the efficiency improvement of fan systems within buildings.

### Proposed Performance Levels 2010

- Motors - introduction of a MEPS for motors based on the current EFF1 performance level.
- Fans - implementation of procedures within the supply chain that will lead to improved fan system efficiency. Some limited labelling measures.
- Pumps - implementation of procedures within the supply chain that will lead to improved pump system efficiency. Some limited labelling measures.



## 2. Policy Action Plan

This Policy Action Plan identifies the policies that could improve the resource efficiency of products. It also identifies the key actions necessary to successfully implement the policies, the principal action owner(s), a sensible timeline for the necessary steps to take place as well as the key barriers to implementation.

ID	Policy	Action Plan	Action Owner	Start / Completion Date	Issues (see section 3)
1	Pumps - Inform BPMA and associated industry bodies about energy efficiency priorities and assist development of their respective strategies.				
	Industry develops energy efficiency strategy by consensus and in line with government priorities  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Inform the BPMA and associated industry bodies about energy efficiency priorities and assist development of their respective priorities	MTP	2005	
2	Pumps: Evidence Base				
	Better knowledge of energy use by pumps in industry  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Policy Scenario	Research pump market and gather further data on sales and distribution of pumps by type and application in the UK. Develop model demonstrating energy use by pumps	BPMA/MTP	2006	03
3	Pumps: Procurement				
	Change in procurement behaviour leading to an increase in more energy efficient purchases. Influenced by more information, better selection tools and minimum behavioural standards in the supply chain. (Significant energy saving potential).  <b>Implementation Date:</b> 2008 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Ensure industry commitment to achieve objectives	BPMA	2006	02
		Recruit the supply chain to promote the correct configuration and matching of pumps, motors and systems. Achieve Best Practice levels or minimum standards	BPMA/The Carbon Trust?	2006	
		Engage other stakeholders (inc. other associations in the wider supply chain)	BPMA/MTP	2006	
		Develop behavioural or performance procedures appropriate to each part of the supply chain	BPMA/Other Stakeholders	2006	
		Develop better design/selection tools and best practice guides, E.g. Pump System Assessment Tool -PSAT	BPMA/Europump/EU	2006	
		Develop other procurement tools, E.g. Labelling	BPMA/The Carbon Trust	2006	
		Produce Best Practise Guide on Energy Efficiency in pumping systems	BPMA	2005/2006	

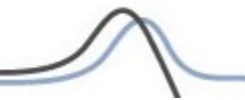


		Promotion (Promote supply chain initiatives / standards and procurement tools amongst purchasers)	BPMA/MTP/The Carbon Trust/EU?	2006	
4	Pumps: Voluntary Agreement - Motors				
	Positive support for the ECA scheme. Improve efficiency of motors supplied with pumps.  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Formalise a Voluntary Agreement for manufacturers to only offer High Efficiency motors with pump products E.g. ECA compliant	BPMA	2006	
5	Pumps: Product Performance Information				
	Product performance information including indicative high and low performance indicators for centrifugal pumps.  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Form working group	BPMA/MTP	2005	
		Agree test standards and test methodologies	BPMA/MTP	2005	04
		Collate pump performance data	BPMA/MTP	2005	
		Propose and agree target performance time series	BPMA/MTP	2005	
6	Pumps: Voluntary Agreement - labelling				
	Sales of higher efficiency pumps increased whilst sales of poor performing pumps reduced.  <b>Implementation Date:</b> 2008 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Agree pumps types to label and appropriate test methodologies	BPMA/MTP	2006	04
		Agree performance thresholds for labels	BPMA/MTP	2006	
		Adopt labelling scheme & promote	BPMA/MTP/Europump?	2006	
7	Pumps: Enhanced Capital Allowances				
	Potential for energy saving on uptake of more energy efficient pumps.  <b>Implementation Date:</b> 2008 <b>Cost to implement:</b> <b>Current Status:</b> Policy Scenario	Agree with the Carbon Trust pump categories for inclusion on the Energy Technology List using performance targets agreed above	BPMA/The Carbon Trust	2006	
		Market the ECA scheme for pumps categories	BPMA/The Carbon Trust	2007	
8	Pumps: Minimum Standard				
	Phasing out of poor efficiency pumps  <b>Implementation Date:</b> 2010 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Identify pump types that minimum standards may be applied to. Input into the consultation process on the EuP study on pumps	BPMA/MTP/EU	2006	
		Agree outputs from the EuP pump study and adopt	EU	2010?	
		Implement in the UK under the EuP directive	DEFRA?	2010?	
9	Pumps: Minimum Procurement Standard for Systems				



Significant energy savings achieved through installation of optimised pumping systems.  <b>Implementation Date:</b> 2010 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Define minimum performance standards for pumping systems	BPMA/MTP	2006	
	Promote minimum standards across industry. Press for Government procurement guidelines to purchase against these minimum standards.	BPMA/MTP	2008	
	Propose minimum standards as mandatory minimum standards	MTP	2010	

ID	Policy	Action Plan	Action Owner	Start / Completion Date	Issues (see section 3)
1	MOTORS - Electric Motors Labelling Scheme				
	Identify and increase sales of Higher Efficiency Motors with a wider scope (1.1-400kW in 2, 4, 6 and 8 poles).  <b>Implementation Date:</b> 2010 <b>Cost to implement:</b> <b>Current Status:</b> Policy Scenario	Continue promotion of the existing motors labelling scheme	Manufacturers/The Carbon Trust	2000	
		Provide funding support to the SEEEM (Standards for Energy Efficiency in Electric Motors) initiative. This initiative seeks to find ways to harmonise international test standards and motor performance labels	MTP	2006/2007	
		Agree to the use of more accurate test procedures to measure motor efficiency (E.g. IEC61972), or revise the existing test procedure (EN60034-2)	Manufacturers/CEMEP/EU/SEEEM Initiative	2006/2007	01
		Agree future efficiency bands for motors, expand the scope of these bands to motors 400kW in 2, 4, 6 & 8 poles. Use new test procedures Introduce future efficiency bands.	Manufacturers/CEMEP/EU/SEEEM Initiative	2006/2007	02
		Adopt revised motor labelling scheme	EU/CEMEP	2007	
		Implement the revised EU motor labelling scheme in the UK The ECA scheme to adopt new levels for promotion of High Efficiency motors	The Carbon Trust	2008	
2	MOTORS Minimum Standard				
	100% volume sales of motors to be Eff.1 class or better. Reduction in the installed base of lower efficiency motors.  <b>Implementation Date:</b> 2010 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Press for development of Minimum standards for electric motors. Input to ministers, EU and CEMEP. Input into EuP study for electric motors.	MTP	2006/2007	02
		Adopt minimum standards Directive (EuP)	EU	2008	
		Implement EU Directive in UK	DEFRA?	2010	
3	MOTORS Enhanced Capital Allowances				



	Volume sales of High Efficiency Motors to increase to 30% by 2012.	Implement and promote the ECA scheme.	The Carbon Trust/Manufacturers	2001	05
	<b>Implementation Date:</b> 2012 <b>Cost to implement:</b> <b>Current Status:</b> Policy Scenario	Expand the range of motors covered by the Enhanced Capital Allowance Scheme to include motor types other than AC induction motors that may achieve similar or better efficiency levels.	The Carbon Trust	2006	
4	Variable Speed Drives - Enhanced Capital Allowances				
	Sales increase of VSDs by 30% in energy saving applications from 2000 levels.  <b>Implementation Date:</b> 2010 <b>Cost to implement:</b> <b>Current Status:</b> Policy Scenario	Implement and promote the ECA scheme	The Carbon Trust/Manufacturers/Gambica	2000	05
5	VSD Information				
	Ensure the appropriate use and increased selection of variable speed drives in energy saving applications.  <b>Implementation Date:</b> 2010 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Promote guidance tools and materials on the most appropriate use of VSDs in energy saving applications.	Manufacturers/The Carbon Trust	2006	09 08 010
6	Encourage VSD suppliers to participate in fan & pump supply chain voluntary agreements				
	Energy savings achieved through the better application of fan and pump systems.  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Encourage VSD suppliers to participate in fan and pump supply chain voluntary agreements.	MTP/BPMA/FMA	2006	
7	Promote savings potential in technologies associated with motors				
	Energy savings may be achieved in improving the efficiency of the peripheral technologies associated with electric motors  <b>Implementation Date:</b> 2006 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Develop best practice guide on the efficient use of transmissions, E.g. belts, couplings, gearboxes	Manufacturers/The Carbon Trust	2006	
		Develop best practice guide informing the energy saving benefits of managing power quality and power factor	Manufacturers/The Carbon Trust/Rema	2006	



ID	Policy	Action Plan	Action Owner	Start / Completion Date	Issues (see section 3)
1	Fans - Inform FMA and associated industry bodies about energy efficiency priorities and assist development of their respective strategies.				
	Industry develops energy efficiency strategy by consensus and in line with government priorities.  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Inform FMA and associated industry bodies about energy efficiency priorities and assist development of their respective strategies	MTP	2005	
2	Fans: Evidence Base				
	Better knowledge of energy use by fans in industry  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Policy Scenario	Research fan market and gather further data on sales and distribution of fans by type and application in the UK. Develop model demonstrating energy use by fans	FMA/MTP	2006	03
3	Fans: Information				
	Change in procurement behaviour leading to an increase in more energy efficient purchases. Influenced by more information, better selection tools and minimum behavioural standards in the supply chain. (Significant energy saving potential).  <b>Implementation Date:</b> 2008 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Ensure industry commitment to achieve objectives	FMA	2006	
		Recruit the supply chain to promote the correct configuration and matching of fans, motors and systems. Achieve Best Practice levels or minimum standards	FMA/MTP/The Carbon Trust	2006	
		Engage other stakeholders (inc. other associations in the wider supply chain)	FMA/MTP	2006	
		Develop behavioural or performance procedures appropriate to each part of the supply chain	FMA/Other stakeholders	2006	
		Develop other procurement tools, E.g. labelling	FMA/MTP	2006	
		Develop system efficiency guide	FMA	2006	
		Develop new case studies on improving the efficiency of fan systems	The Carbon Trust/Manufacturers/FMA	2006	
		Promotion (Promote supply chain initiatives / standards and procurement tools amongst purchasers)	FMA/MTP/The Carbon Trust	2006	
4	Fans: Voluntary Agreement - Motors				



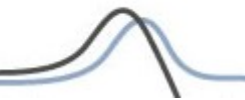
	Promotion of high efficiency motors. Improved efficiency of fan and motor combinations.  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Formalise a voluntary agreement for members to only offer high efficiency induction motors on appropriate fan products.	FMA	2006/2007	
5	Fans: Product Performance Information				
	Product Performance information including high and low performance indicators for popular fan types.  <b>Implementation Date:</b> 2007 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Form working group	FMA/MTP	2005	
		Agree test standards and test methodologies	FMA	2005	
		Collate fan performance data	FMA/MTP	2005	06
		Propose and agree target performance time series	FMA/MTP	2005	
6	Fans: Voluntary Agreement - labelling of certain fans				
	Sales of higher efficiency fans increased whilst sales of poor performing pumps is reduced.  <b>Implementation Date:</b> 2008 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Agree fan types to label and appropriate test methodologies	FMA	2006	
		Agree performance thresholds for labels	FMA	2006	
		Adopt labelling scheme and promote	FMA/MTP	2006	
7	Fans: Enhanced Capital Allowances				
	Potential for energy savings on uptake of more efficient fans.  <b>Implementation Date:</b> 2008 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Agree with the Carbon Trust specific fan categories to be included on the Energy Technology List using agreed performance targets	FMA/The Carbon Trust	2006	
		Market the ECA scheme for fans	FMA/The Carbon Trust	2007	
8	Fans: Minimum Standard				
	Phasing out of poor efficiency fans  <b>Implementation Date:</b> 2010 <b>Cost to implement:</b> <b>Current Status:</b> Reference Scenario	Identify fan types that minimum standards may be applied to. Input into the consultation process on the EuP study for fans	FMA/MTP/EU	2006/2007	
		Agree and adopt outputs of EuP study for minimum standards for fans	EU	2010?	
		Implement minimum standards in the UK for fans under the EuP directive	DEFRA?	2010?	



## 3. Critical Issues

The following issues have been identified as important to the development of a reliable and effective evidence base. The most important issues are near the top of the list. Reference numbers link back to the related policies.

Issue No.	Issue	Action	Action Owner	Completion Date / Comment
01	The European motor test standard EN60034-2 is insufficiently accurate and should be revised or replaced.	MTP to participate in SEEEM initiative which will seek to harmonise test procedures and performance labels. EU to press CEMEP to agree to the use of a more accurate test standard.	MTP/SEEEM/CEMEP	2007
02	International co-operation is required	Engage with EU & other international stakeholders	MTP	2007
03	ENERGY CONSUMPTION MODEL (MOTORS): When considering energy consumption by motors the current model has some overlap between the Motor Driven Systems and the Refrigeration & Air Conditioning product areas. Whilst the model considers motors in the size range 1.1kW through 400kW, the overall energy consumption figures reported are calculated for all motors in industrial & commercial applications.	The assumptions used in defining the boundaries of the model and overlaps with other motor types such as single phase units under 1.1kW or those greater than 400kW need to become more robust. Stakeholders are invited to input into the continued maintenance and revision of the model.	MTP	2007
04	Pumps: The International test standard for rotodynamic pumps, ISO:9906 does not have adequate provision for accurate efficiency testing. The standard is currently in the process of revision.	Keep informed on progress of the revision and what improvements there will be with regard to tolerances when measuring efficiency	BPMA/MTP	2007
05	It is the perception of the suppliers that the ECA scheme is not effective	Increase promotion of the ECA scheme	The Carbon Trust / Manufacturers	2007
06	Fans: Manufacturers have been unwilling to submit performance data as some deem it sensitive commercial information.	Look for similar schemes set up by other countries. Find ways to ensure security of data and protect companies	FMA/MTP	2006
07	A high number of government organisations, and not for profit companies in the country are excluded from the ECA scheme	Develop other promotional methods and messages targetting organisations excluded from the ECA scheme	BPMA/FMA/GAMBICA/REMA/The Carbon Trust/MTP	2008
08	In some applications, installing a variable speed drive is not the correct measure to reduce energy.	A continued supply of information is required, identifying the best energy saving applications for VSDs, the correct methods for installation and the potential problems of installing them in the wrong applications. The user should be armed with enough knowledge to ask the correct questions of the supplier	Manufacturers/GAMBICA/The Carbon Trust	2007



09	VSDs are seen as a complex technology and are not completely understood	Continue to produce educational materials and tools on the correct use of VSDs in energy saving applications	Manufacturers/GAMBICA/The Carbon Trust	2007
010	Industry is questioning whether all VSDs can be fitted to all motor types. There is some evidence to suggest that better efficiencies can be achieved by matching specific VSDs to specific motors.	Carry out study to look at different combinations of motors and VSDs.	GAMBICA	2008
011	Inadequate funding available to successfully implement the work.	Develop mechanisms to generate funding	Stakeholders/MTP	2010

## 4. Further Information

The following documents are linked to this Policy Brief and present the underlying evidence base of information, such as further explanations, definitions, assumptions and important background information:

- Briefing Note > [BNM03 - Enhanced Capital Allowances for Motors](#)
- Briefing Note > [BNM02 - Minimum Efficiency Performance Standards \(MEPS\) for electric motors](#)
- Briefing Note > [BNM01 - Revising EU motor labelling scheme and MTP actions to increase UK adoption of higher efficiency motors](#)
- Briefing Note > [BNM04 - Enhanced Capital Allowances for Variable Speed Drives](#)
- Briefing Note > [BNM06 - Energy Efficiency Test Standards for Motor Systems](#)
- Policy Brief >
- Web > [www.mtprog.com](http://www.mtprog.com)

## 5. List of Consultees

The following organisations have been consulted on the content of this Policy Brief:

Rotating Electrical Machines Association. Fan Manufacturers Association. British Pumps Manufacturers Association. The Carbon Trust (CT). Department for Environment, Food and Rural Affairs (DEFRA) Department of Trade & Industry (DTI).