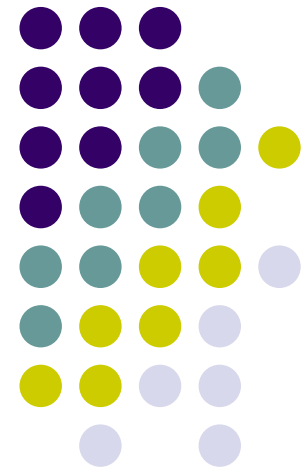


Electric Motors – Alignment of Standards and Best Practice Programmes with APEC



Asia-Pacific
Economic Cooperation



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China National Institute of Standardization (Project Overseer)

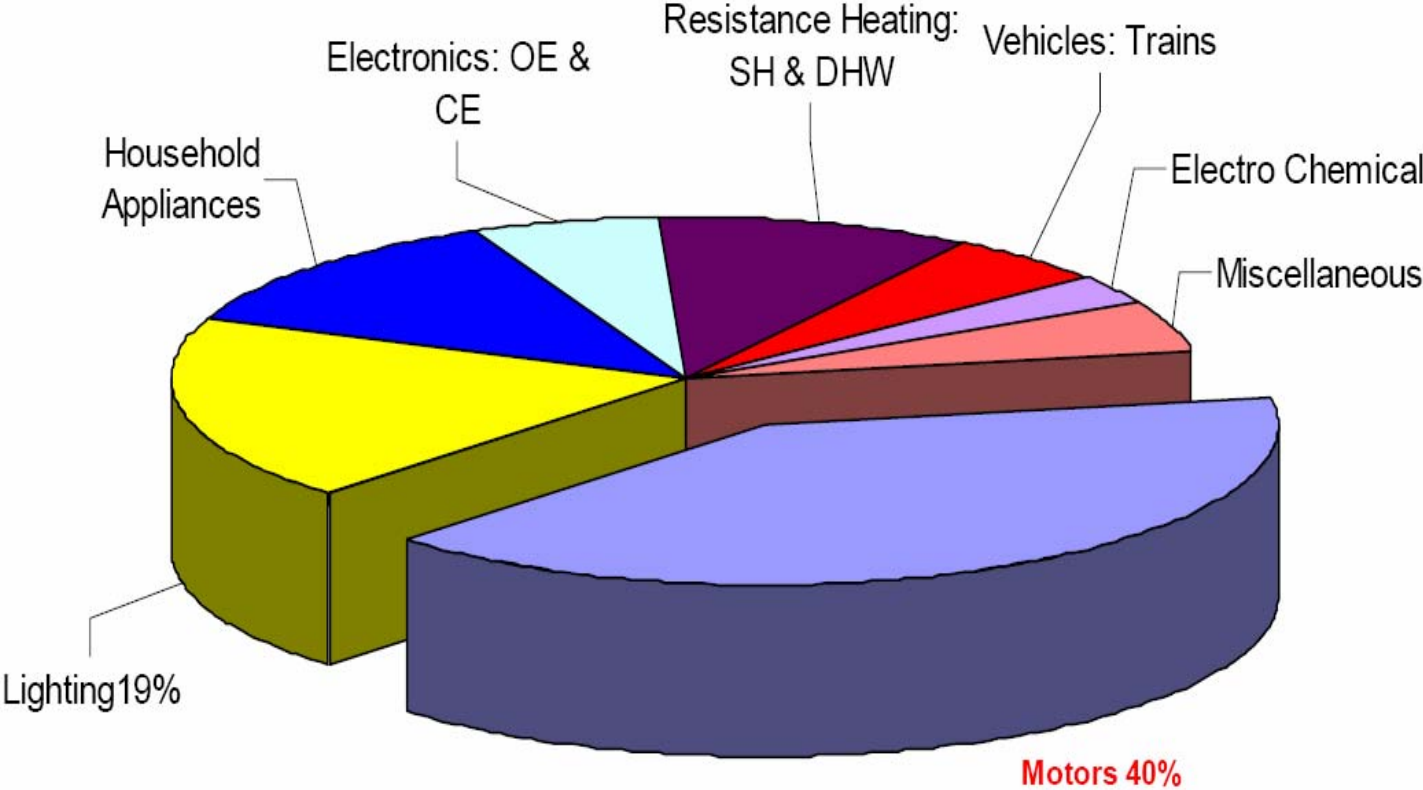
China Standard Certification Centre (Project Executor)

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Project Background



Project Background



Biggest Market Players (0.7-370 kW)

(2005) Motors	Sales national (million)	Export (million)	Import (million)
■ EU	9.1	4.1	5.1
■ Japan	8.0	1.2	2.8
■ China	5.6	0.8	0.7
■ USA	1.6		
■ Brazil	1.3		
■ India	1.0		
■ Thailand	0.8	0.1	0.4
■ Korea	0.4		
■ Australia	0.3	0.0	0.3

Source: A+B International 2007

Project Background



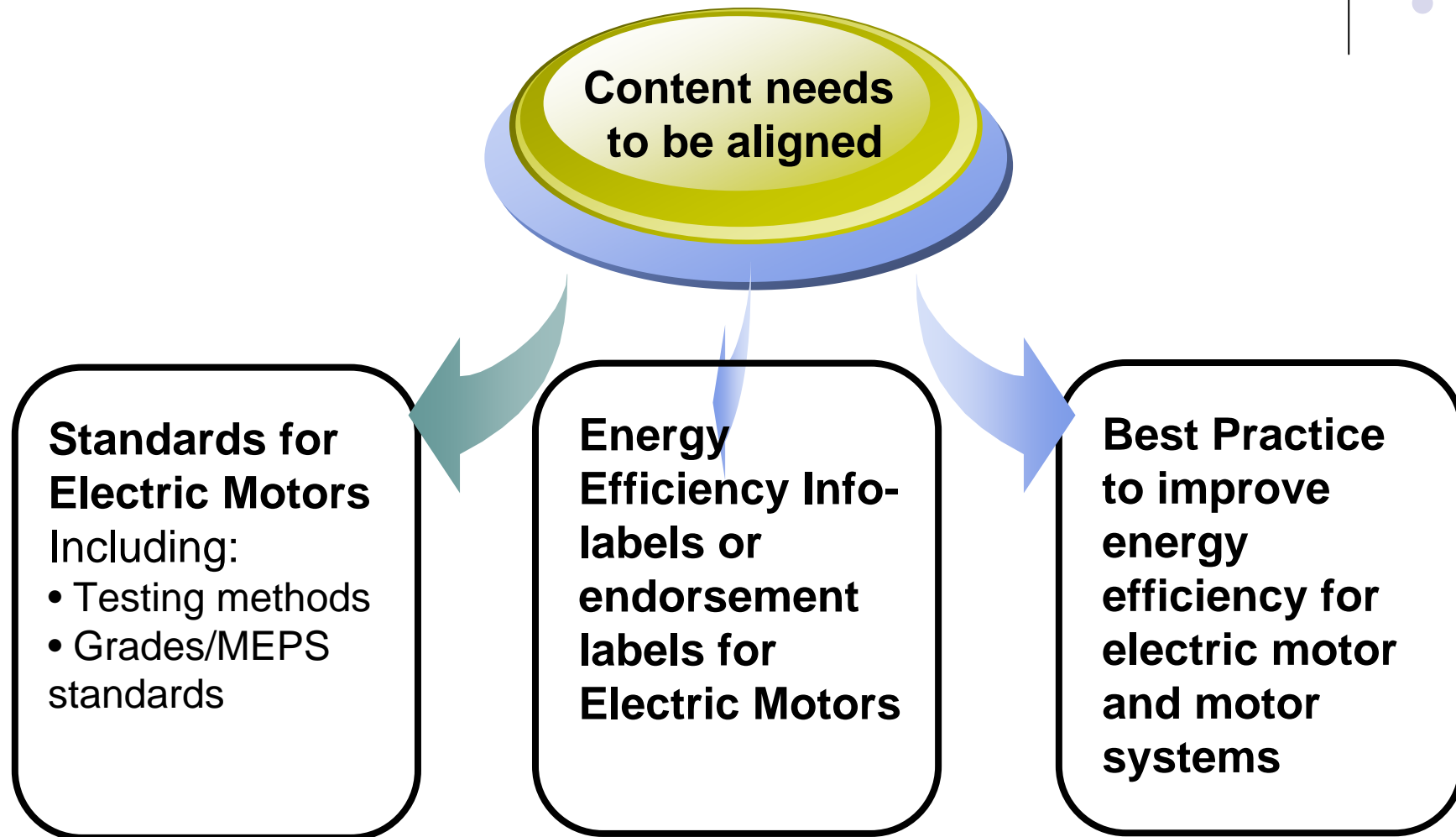
- Currently, minimum energy performance standards (MEPS) and endorsement label performance requirements are quite different in APEC economies, and based on differing test methods



Project Objective

- The project aims to promote the harmonization of motor efficiency testing methods and energy performance standard in APEC member economies
- This work has been making a close cooperation with the new IEC testing method (IEC 60034-2-1) and the energy efficiency grades standard (IEC 60034-30)
- The project aims to build a specific communication mechanism to share experience and update information of motor energy conservation in major APEC economies; to facilitate the use of a single common test method and promote appropriate performance and efficiency endorsement levels amongst member economies

Harmonization Work





Motor Efficiency Testing

- In order to comply with the different regulatory measures applicable around the world motors' efficiency has to be tested according to different test methods.



Motor Efficiency Testing

1. North America and Latin America (U.S., Japan, etc.)

Standards apply to motors tested with Input-Output Method

- IEEE 112 – Method B
- CSA 390 – Method 1

2. CEMEP Agreement (China, Korea, etc.)

Assigned allowance for “Stray-load losses”

IEC 60034-2 (1996) – fixed 0,5 % of full load input power (China)

IEC 61972 (Korea)

◇ Australian Energy Performance Program

Two tables:

- AS 1359.102.3 - Input-Output Method similar to IEEE 112 – Method B
- AS 1359.102.1 – IEC 60034-2 (1996) with SLL fixed at 0,5 % of full load input power



New IEC 60034-2-1 Standard

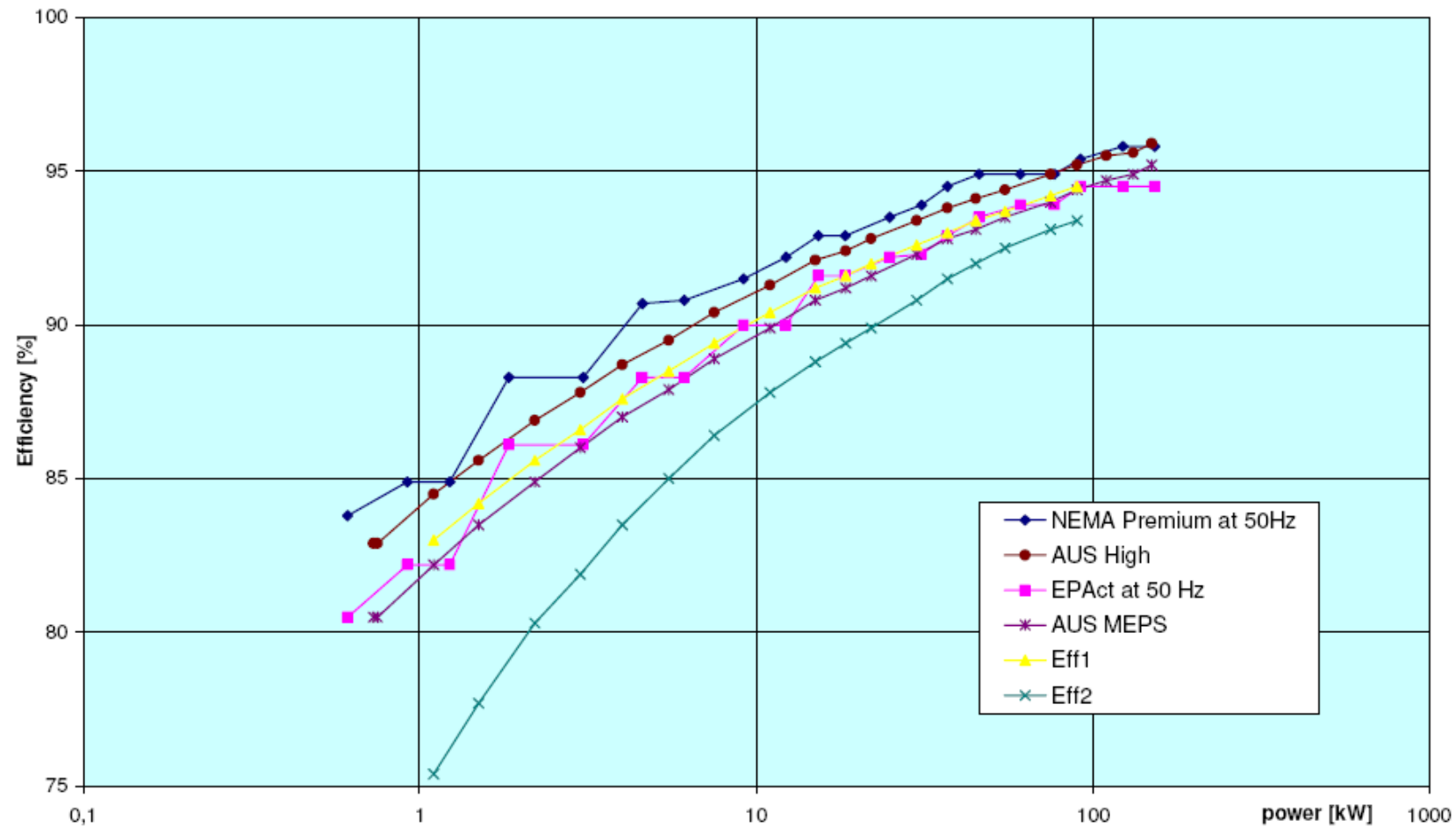
- IEC approved Sep/2007 the new global Motor Efficiency Testing Standard IEC 60034-2-1: (excluding machines for traction vehicles)

Table 2 – Induction machines

P_{LL} determined from residual loss	8.2.2.5.1	Three phase > 1 kW up to 150 kW	Torquemeter/dynamometer for $\geq 1,25 \times$ full-load	Low
P_{LL} from assigned value	8.2.2.5.3			Medium to high
P_{LL} from removed rotor and reverse rotation test	8.2.2.5.2		Auxiliary motor with rated power $\leq 5 \times$ total losses P_T	High
P_{LL} from Eh-star test	8.2.2.5.4	(see Note 3)	Resistor for 150 % rated phase current	Medium

Note 3: The method for PII from Eh-Star is suitable for motors between 1 and 150 kW; larger ratings are under consideration

Comparison of minimum efficiency requirements in major APEC economies



Existing Rules in Major Members



Country/Region	Mandatory Agreements (year of implementation)	Voluntary Agreements (year of implementation)	Market Share
U.S.A	EPAAct – High Efficiency (1997)	Nema Premium (2001)	NEMA Premium (16%) EPACT (54%)
Canada	EPAAct – High Efficiency	Nema Premium (2001)	NEMA Premium (16%) EPACT (54%)
Mexico	EPAAct – High Efficiency (1998)	Nema Premium (2003)	n.a.
EU		Efficiency Classification and market reduction of EFF3 (1998)	EFF1 (9%) EFF2 (87%) for CEMEP agreement members
Australia	High efficiency (2006)	Premium efficiency (2006)	Premium (10%) High efficiency (32%) Standard (58%)
New Zealand	High efficiency (2006)	Premium efficiency (2006)	n.a.
Brazil	Standard Efficiency (2002) High Efficiency (2009)	High Efficiency	High Efficiency (15%)
China	Standard Efficiency (2002) High Efficiency (2010)	High Efficiency (2002) Premium (2010)	High (1%) Standard (99%)
Korea		Standard efficiency (1996)	High (10%) Standard (90%)

IEC 60034-30



- Several different energy efficiency classes are currently in use, increasing potential confusion and creating market barriers.
- IEC is now developing a classification standard, IEC 60034-30, trying to harmonize different requirements for induction motors efficiency levels.
- Efficiency and losses shall be tested in accordance with revised IEC60034-2-1
- Four efficiency classes are being proposed:
 - IE4: Super premium (10-15% lower losses than class IE3)
 - IE3: Premium efficiency
 - IE2: High efficiency (existing Eff1, EPAAct)
 - IE1: Previously “Improved efficiency” (existing Eff2)
 - Below Standard: Previously “Standard efficiency” (existing Eff3)



Energy Efficiency Labels

Economy	MEPS	Information or Endorsement label
United States	Yes (EPA Act level, Nema Premium)	Yes
Australia	Yes (eff2 in 2001 and eff1 in 2005)	Yes
China	Yes (eff3 in 2002 and eff2 in 2006)	Yes
Korea	Yes (effective from July 2008)	Yes
Japan	N/A	N/A

Update on major members



United States

- Current minimum efficiency standards of general purpose induction motors (1-200 hp) as defined in 1992's EPL Act and covered by federal legislation should be raised to NEMA Premium levels.
- Seven types of low voltage poly-phase, integral-horsepower induction motors not currently covered under federal law should be subjected to minimum efficiency standards at the levels defined in 1992's EPL Act for general purpose induction motors.
 - – U-Frame Motors Design C Motors
 - – Close-coupled pump motors
 - – Footless motors
 - – Vertical solid shaft normal thrust (tested in a horizontal configuration)
 - – 8-pole motors (~900 rpm)
 - – All poly-phase motors with voltages up to 600 volts other than 230/460 volts
- General purpose induction motors with power ratings between 200 and 500 horsepower should also meet minimum efficiency levels as specified in 1992's EPL Act.

Update on major members



Australia

- Australia has started to work with like-minded countries to identify the most accurate method of test. There are two methods set in the standard, Method A measures stray load losses directly, while Method B estimates these losses. In the future, E3 expects to check test using both of these methods
- Intends to facilitate the efficiency testing and maybe a supplementary round-robin testing between China and Australia based on the new IEC round-robin testing activity

Update on major members



China

- **Planning to revise the motor efficiency standard (GB18613-2006) in next 2 years to keep efficiency values in line with the requirements of IEC 60034-30**
- **Prepare the round-robin test for various testing methods**
- **Energy Efficiency Grades label for electric motor in China has just been taken into effective on 1 June, 2008**

Next Steps



1. To clarify the uncertainty for various motor efficiency testing methods listed in IEC 60034-2-1
2. In accordance with the specific situation of each economy, to choose a suitable testing standard and prepare the corresponding laboratory qualification work and capacity building
3. Plan to revise relevant motor efficiency standards to ensure the efficiency values specified in the standard in line with the values set in the IEC 60034-30
4. Keep an eye on MEPS improvement (IE2 by 2010 and IE3 by 2012) and make a plan to connected respective domestic MEPS with the IEC ones
5. Need much more work and programs to form an effective communication platform to share experience of improving motor and motor system efficiency, and best practice in each economy

Thank You !

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