

Technical Reference on Harmonization of Energy Efficiency Test Methods of Refrigerators towards the NEW IEC 62552 among APEC Region

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Asia-Pacific
Economic Cooperation

Contents

- **Project Introduction**
- **Project Outputs**



1- Project Introduction



The **Overall Objective** is:

To facilitate energy saving technology innovation for refrigerators and free trade in the APEC region by helping harmonizing energy efficiency testing methods for refrigerators with the new IEC62552 Standard, and by supporting the development of an effective management and inspection environment in APEC.

Duration: Sep, 2014 to Apr, 2016.

1- Project Introduction



Specified Objectives are:

Objective 1:

to identify commonalities and differences between the new IEC 62552 standard and energy efficiency testing standards for refrigerators currently used in APEC economies;

Objective 2:

to determine pathways for the harmonization of energy efficiency testing methods of APEC economies and the new IEC 62552-3 for refrigerators;

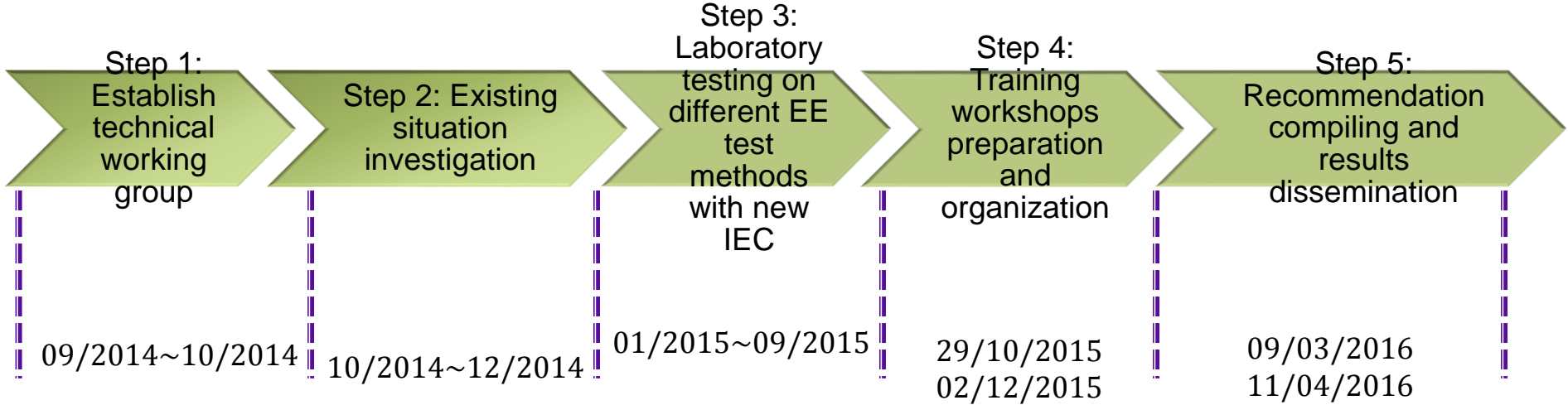
Objective 3:

to build capacities and awareness of APEC region's stakeholders and synergize their efforts related to the harmonization of testing standards for refrigerators.

2- Project Outputs



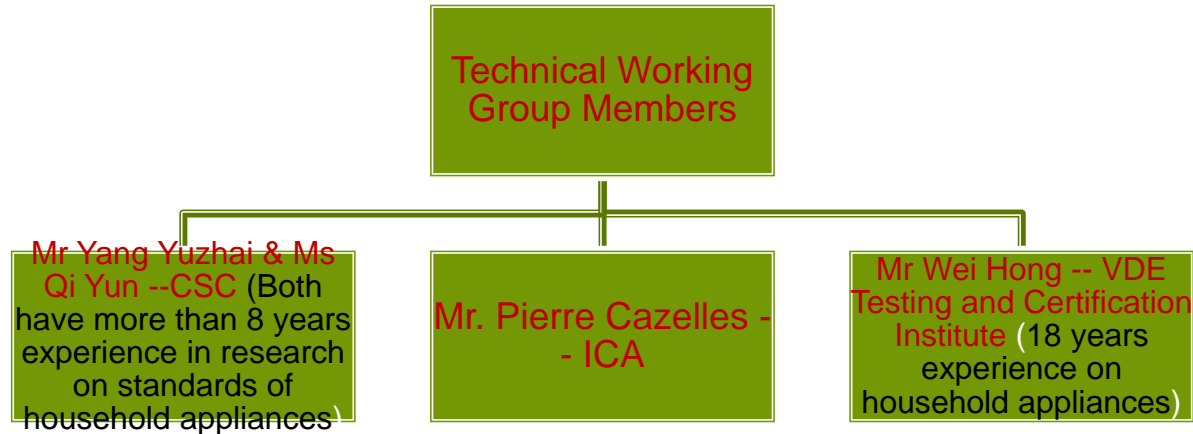
Action Plan



2- Project Outputs



Output 1: Establish technical working group





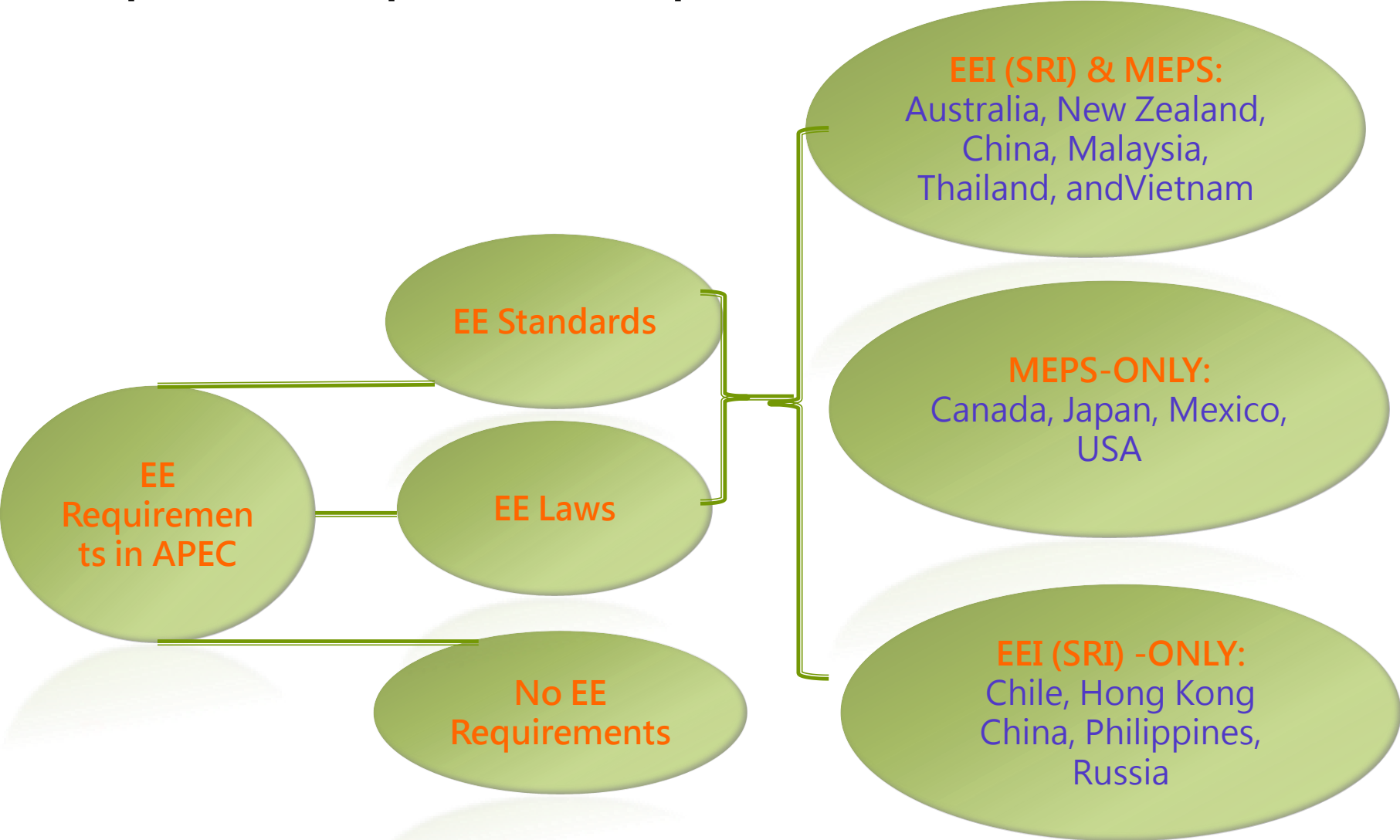
Advantages of IEC 62552:2015:

- Appliances are tested in empty condition, which can fast to achieve a stable state
- Tests are to be performed at two ambient temperatures (16°C and 32°C), which allows an accurate estimation of energy use across a rang of ambient temperatures ;
- Load processing test considers the user interact, which more close to the real usage of refrigerator
- Detail specification for sensors location makes appliance setup more clearly
- A new adaptive test algorithm is introduced in energy consumption testing, which makes energy efficiency test more flexible and shortens the test period;
- Volumes measurement will be based on the ‘cooled volume’

2- Project Outputs



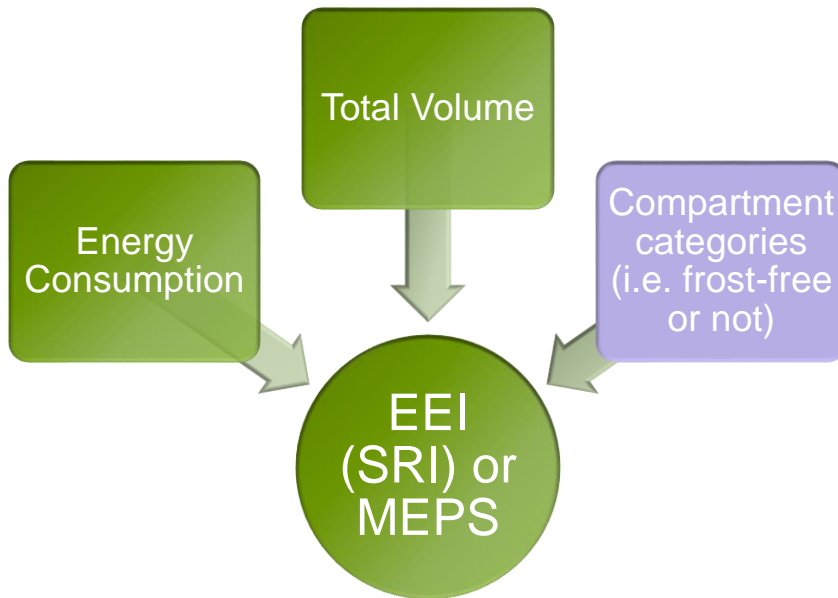
Output 2: Desktop Research Report



2- Project Outputs



Output 2: Desktop Research Report



Key Elements in Testing Methods:

1. Test conditions
2. Measuring instruments
3. Installation of refrigerators
4. Determination method of the energy

2- Project Outputs

Output 2: Desktop Research Report

Table of Contents

1. Introduction	4
2. Analysis of Energy Efficiency Standards and Labelling Schemes (EE S&L) in the APEC region	5
2.1 Overview of APEC Energy Efficiency Standards and Labelling (EE S&L) Schemes for Refrigerators	5
2.2 Comparison of APEC EE Labelling Schemes for Refrigerators	6
2.3 Comparison of EE evaluation methods in EE standards or laws in APEC	8
2.4 Examples of EEI (SRI) Calculation in EE standards of APEC Region	15
3. Analysis of Test Methods in the APEC region	19
3.1 Overview of Test Method Standards for Refrigerators	19
3.2 Comparison of Test Methods Standards for Refrigerators in APEC economies	20
4. Conclusion	27
Annex I EE Standards or Laws for Refrigerator in the APEC Region	28
Australia	28
Canada	33
Chile	36
China	39
Hong Kong, China	42
Chinese Taipei	45
Japan	47
Korea	49
Malaysia	50
Mexico	52
New Zealand	54
Philippines	54
Russia	56
Singapore	59
Thailand	61
USA	63
Viet Nam	67
Annex II Test Methods for Refrigerators in APEC Region	69
Australia/ New Zealand	69
Chinese Taipei	72



PRC

7 appliances (compartment) categories



Singapore

3 appliances categories and 7 compartment categories

2- Project Outputs



Output 3: Laboratory Testing Report



Upright Refrigerator



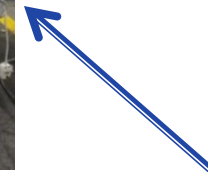
Chest Freezer



Upright Refrigerator-freezer



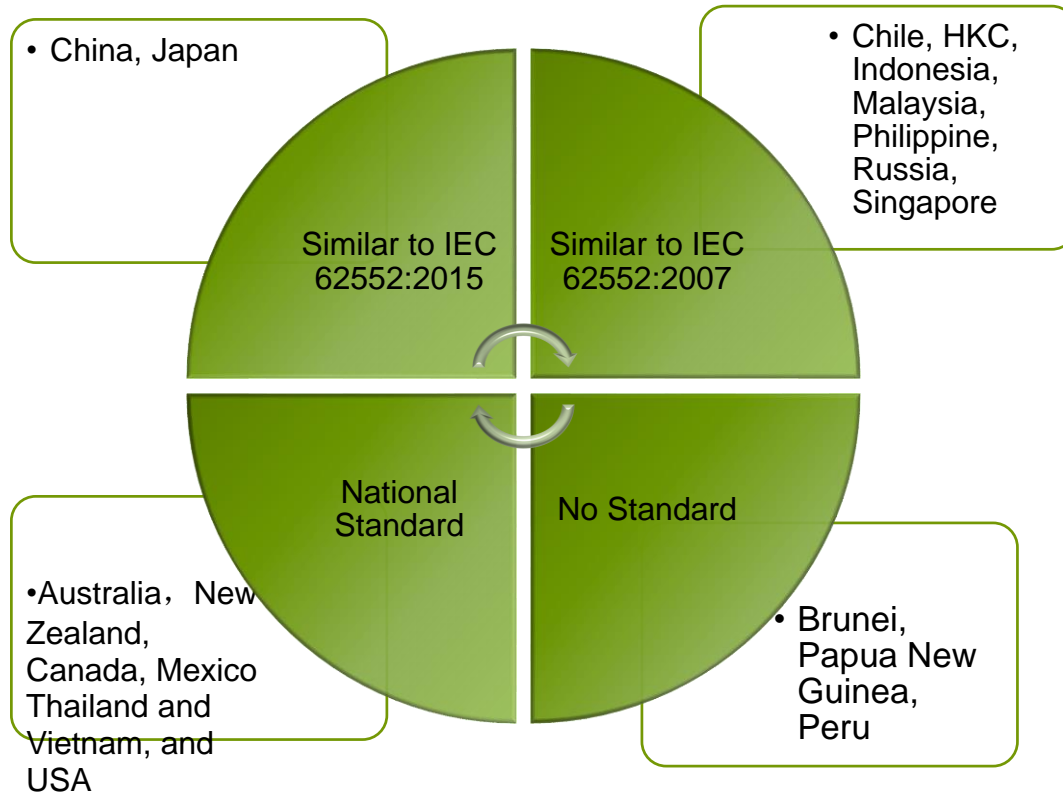
Upright Frost-free Refrigerator-freezer



2- Project Outputs



Output 3: Laboratory Testing Report



Key Elements in Testing Methods:

1. Test conditions
2. Measuring instruments
3. Installation of refrigerators
4. Determination method of the energy

2- Project Outputs



Output 3: Laboratory Testing Report

	Upright Refrigerator	Upright Refrigerator-freezer	Chest Freezer	Upright Frost-free Refrigerator-freezer
Model	BC-92	BCD-200	BD-295	BCD-322W
Climate class	ST	ST	ST	ST
Temperature Control Device	Mechanical	Mechanical	Mechanical	Electronical
Volume (fresh food/frozen food)	92L	137L/63L	295L	234L/88L
Related Energy Consumption	0.40 kWh/24h	0.50 kWh/24h	0.90 kWh/24h	0.76 kWh/24h
Manufacture	Hisense	Siemens	LG	Siemens

Items \ Standard	IEC 62552:2015	IEC 62552:2007	USA standard	AU standard
Daily energy consumption	√	√	√	√
Annual energy consumption	√	△	△	△
Volume	√	√	√	√
EEl	√ ⁽¹⁾	√ ⁽²⁾	—	√
Energy Efficiency Grade	√ ⁽¹⁾	√ ⁽²⁾	—	√
MEPS	√ ⁽¹⁾	√ ⁽²⁾	√	√

Note: 1) Calculated according to GB 12021.2-2015;
 2) Calculated according to GB 12021.2-2008.

2- Project Outputs



Output 3: Laboratory Testing Report

AU



USA



IEC 62552:2007



IEC 62552:2015



Test loading view of refrigerator-freezer

2- Project Outputs



Output 3: Laboratory Testing Report

AU



USA



IEC 62552:2007



IEC 62552:2015



Test loading view of frost free refrigerator-freezer

2- Project Outputs

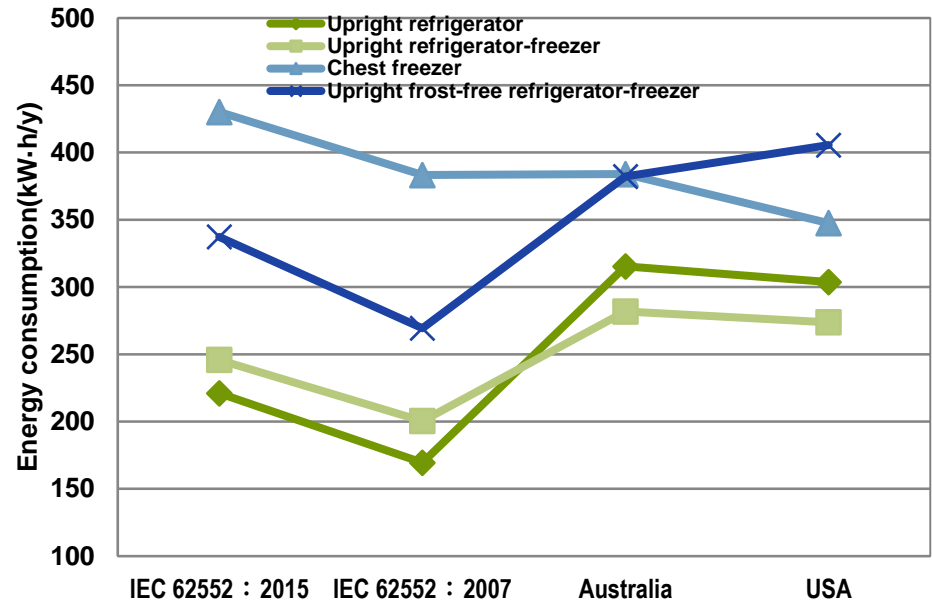


Output 3: Laboratory Testing Report

Annual Energy Consumption test results (IEC 62552-2015 with load processing)

&

Deviation of annual energy consumption for different test methods with IEC 62552-2015



Appliance	Test standards		
	IEC 62552:2007	AU	US
Upright refrigerator	-23.4%	42.6%	37.4%
Upright refrigerator-freezer	-18.5%	14.6%	11.4%
Chest freezer	-10.9%	-10.7%	-19.2%
Upright frost-free refrigerator-freezer	-20.1%	13.3%	20.2%

2- Project Outputs

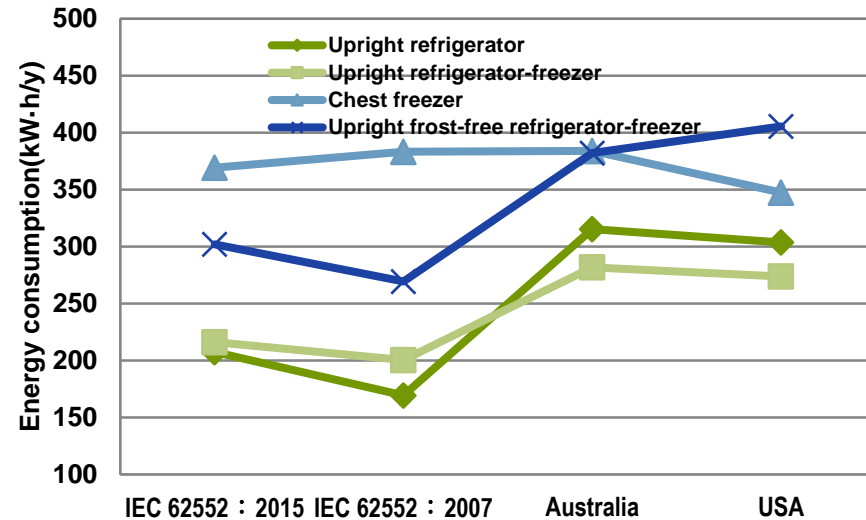


Output 3: Laboratory Testing Report

Annual Energy Consumption test results (IEC 62552-2015 without load processing)

&

Deviation of annual energy consumption for different test methods with IEC 62552-2015 without load processing



Standards Appliance \ Test	IEC 62552:2007	AU	US
Upright refrigerator	-18.3%	52.1%	46.4%
Upright refrigerator-freezer	-7.3%	30.3%	26.5%
Chest freezer	3.8%	4.0%	-6.0%
Upright frost-free refrigerator-freezer	-10.8%	26.5%	34.3%

Standards Appliance \ Test	Additional energy for load processing	Deviation Rate
Upright refrigerator	13.602	6.2%
Upright refrigerator-freezer	29.661	12.1%
Chest freezer	60.774	14.1%
Upright frost-free refrigerator-freezer	35.275	10.5%

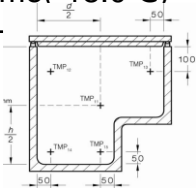
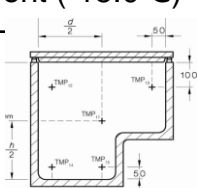
2- Project Outputs



Output 3: Laboratory Testing Report

Philosophy of analyzing **key impacting factors** of energy consumption test methods is to choose two standards with similar certain testing conditions but one or two main different testing conditions, and then to understand the different testing condition's impacts on energy consumption.

Example: compartment temperature impacts for chest freezer

Elements standards	IEC 62552:2015	AU
Room test ambient temperature	Same (32.0°C)	Same (32.0°C)
Target temperature of frozen-food comp.	Same(-18.0°C)	Different (-15.0°C)
Storage plan of frozen-food comp. storage temperature sensor	Same 	Same 
Frozen-food comp. storage temperature sensor	Same(Cylinder)	Same(Cylinder)
Tested daily energy consumptions, kWh/24h	1.309	1.052
Deviation:	$(1.309-1.052)/1.309*100\%=19.6\%$	

2- Project Outputs



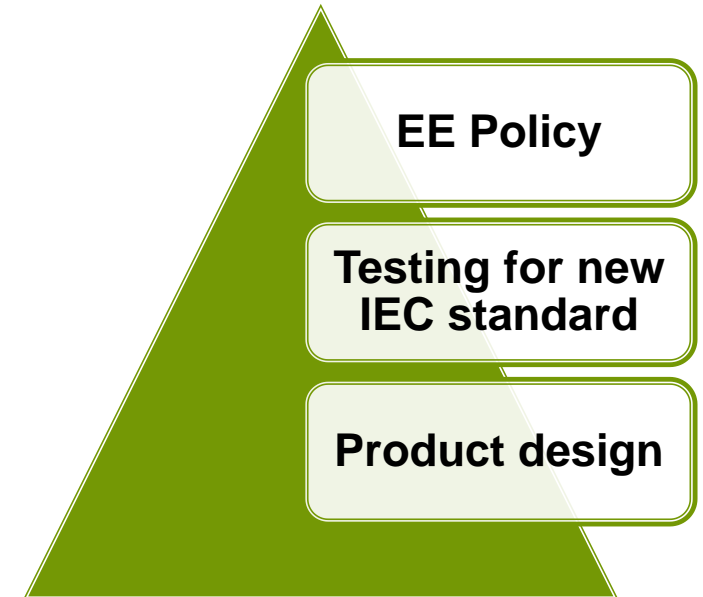
Output 3: Laboratory Testing Report

Key Influencing Factors for Energy Consumption Testing Results When Harmonizing to the NEW IEC 62552:

Key influencing factors	Compartment or appliance	Result	Compared standards
Ambient temperature ¹⁾	refrigerator	+4.5% by 1K increase	IEC 62552:2015 (16°C -32°C)
	freezer	+3.0% by 1K increase	
	refrigerator-freezer	+2.4% by 1K increase	
Target temperature ²⁾	fresh-food comp.	+9% by 1K decrease	IEC 62552:2015 (interpolation)
	frozen-food comp.	-6.5% by 1K increase	IEC 62552:2015-Australia
Storage temperature sensor and storage plan ³⁾	fresh-food comp.	+2.3%	IEC 62552:2015(at 32°C) - US
Storage temperature sensor (cylinder instead of M package) and empty load ⁴⁾	frozen-food comp.	-3.9%	IEC 62552:2015(at 32°C) - US
Determination of frozen-food compartment temperature (average temperature instead of maximum M package) ⁵⁾	frozen-food comp.	-4.1%	IEC 62552:2015-IEC 62552:2007
Twice tests adaptability for one sample at different ambient temperatures	refrigerator	+1.7%	IEC 62552:2015-IEC 62552:2007
	refrigerator-freezer(single temperature control)	+13.2%	IEC 62552:2015-IEC 62552:2007
	frost-free refrigerator-freezer	+5.2%	IEC 62552:2015-IEC 62552:2007

2- Project Outputs

Output 4 &5: Training (2015-10-29 Hefei; 2015-12-02 Guiyang)



2- Project Outputs

Output 6: Harmonization Roadmap to IEC 62552:2015



Key points of Harmonization of energy efficiency test methods of refrigerators towards the new IEC 62552



2- Project Outputs

Output 6: Harmonization Roadmap to IEC 62552:2015



Roadmap of Harmonization of energy efficiency test methods of refrigerators towards the new IEC 62552 in APEC region takes **step by step** according to situation of each economy

1. Technical experts committee
2. Technical alliance

Group A with more developed market , more mature EE policy implementation circumstance and policy support

Group B with similar standard and EE labeling mechanism with Group A but in the economies with medium level of development of their market and EE policies

Group C in the stage of shaping their EE policies and actions

Group D with unique and mature standard and EE labeling mechanism and it is hard to harmonize new IEC standard for policy reason

2- Project Outputs

Output 6: Harmonization Roadmap to IEC 62552:2015



Group A

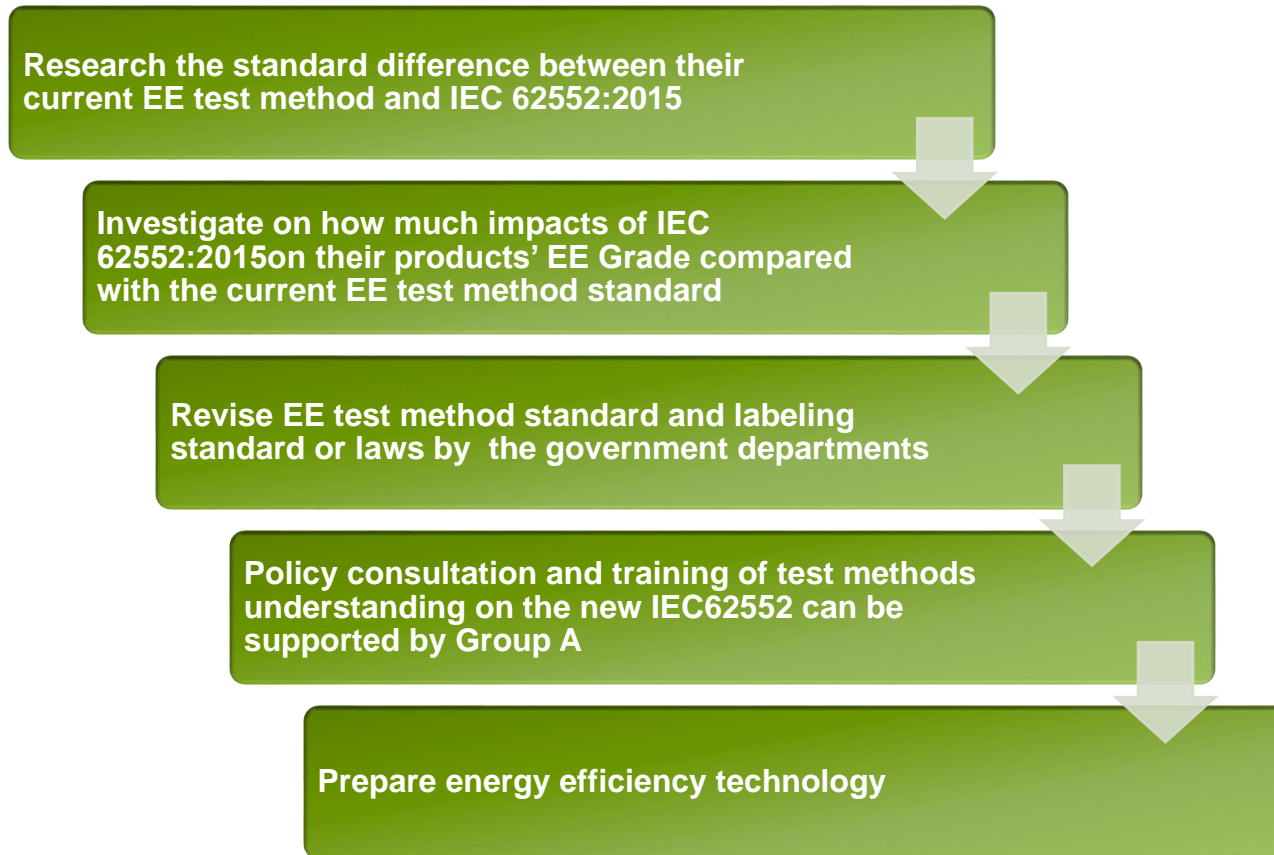


2- Project Outputs

Output 6: Harmonization Roadmap to IEC 62552:2015



Group B

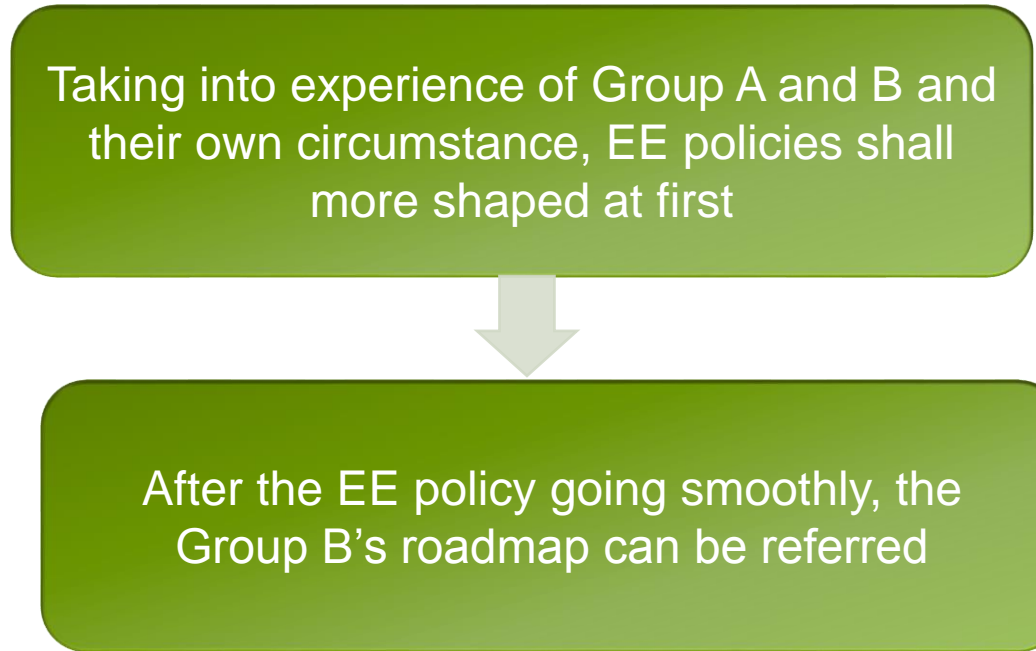


2- Project Outputs

Output 6: Harmonization Roadmap to IEC 62552:2015



Group C



2- Project Outputs



Output 7: Results Dissemination Workshop

Shanghai Mar 9th, 2016 alongside with 2016 AWE (Appliance & Electronics World Expo.) and also in *Taichung* alongside the EGEE&C 47 meeting.



Positive feedback have been received from workshop survey and on-site Q&A session in AWE and in EGEE&C 47



**Differences / synergies between energy efficiency
test methods for refrigerators in APEC region
and with the new IEC 62552**

Desktop Research

Energy Working Group

March, 2016



**Asia-Pacific
Economic Cooperation**

**Differences / synergies between energy efficiency test
methods for refrigerators in APEC region and with
the new IEC 62552**

Laboratory Test Report

Energy Working Group

**March, 2016
China**

Thank You!

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