



Refrigerator/Freezer Energy Efficiency Improvement in APEC Region: Review of Experience and Best Practices (EWG 07 2017A)

Project Updates

Bureau of Energy, MOEA, Chinese Taipei
Industrial Technology Research Institute, Chinese Taipei



APEC EGEE&C 53rd Meeting
20-21 Mar. 2019, Hong Kong, China

Project Information

- Proposing economy: Chinese Taipei
- Co-sponsors: China, Korea
- Project overseer: Mr. Shiao-Jiun Bor
- Duration : July 1st, 2017 to Dec. 31st, 2018
- Budget: APEC funding \$80,000 + Self-funding \$40,000
- Time Frame:



Outline

1. Project objectives
2. Main activities
3. Project status
4. Project Outcomes

Main Activities

- ◆ Project **Work Plan and Structure** of the Work Group.
- ◆ **Technical Review and Promotion Survey:** Questionnaire Survey, Energy Saving Technology Seminar, Literature Review, and **Investigation report**.
- ◆ **Workshop I** — invite experts from different economies to share experiences of refrigerator EE improvement (during the **51st APEC EGEE&C** meeting)
- ◆ **Workshop II**— seek manufacturers to share the best practice implementation to fit the energy efficiency regulation (during the **52nd APEC EGEE&C** meeting)
- ◆ **Final report**

Technical Review and Promotion Survey:

- ◆ Conduct research of APEC economies about refrigerator/freezer EE management through a detailed **questionnaire**

- Part 1- Refrigeration Market (Q1-5)
- Part 2- EE management policies (Q6-11)
- Part 3- Test methods (Q12-13)
- Part 4- Technology needed for refrigerator/freezer EE (Q14-19)

Vietnam

Malaysia

Indonesia

Thailand

New Zealand

Chinese Taipei

Korea

Hong Kong

China

Japan

Singapore

- **Marking:** Sale information collected in APEC region
- **EE Policy:** 80% reported for implementation of MEPS, 50% for high efficient voluntary programs; market surveillance and a registry of approved refrigerators / freezers were cited by all of the economies, except Japan.
- **Test Method:** IEC 62552:2015 by Japan, Vietnam, China, and Thailand(in 2019)
- **Technology:** DC inverter control, vacuum insulation panel; refrigerants include R-134a(30%), isobutane R-600a(40%), and others (30%)

Technical Review and Promotion Survey:

- ◆ Chinese Taipei hosted a **self-funding seminar** titled 'Energy Saving Technology Seminar for Refrigerator/Freezer Energy Efficiency Improvement in APEC Region' on **16 November, 2017** at Taipei City. **Six economies** (China; Indonesia; Malaysia; Chinese Taipei; Thailand; and Viet Nam) and 55 attendees participated in this seminar.
- ◆ Focusing on smart appliances, standard harmonization, environmentally friendly refrigerants, compressor technology and system design, the key technologies were discussed for improving the efficiency of refrigerators.
- ◆ Providing a refrigerator energy saving knowledge sharing platform and refrigerator network integration of EGEE&C to provide energy saving design information



Group photo for APEC delegates in the seminar



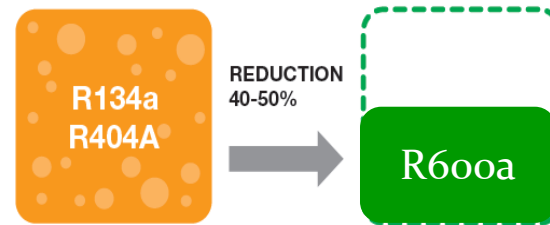
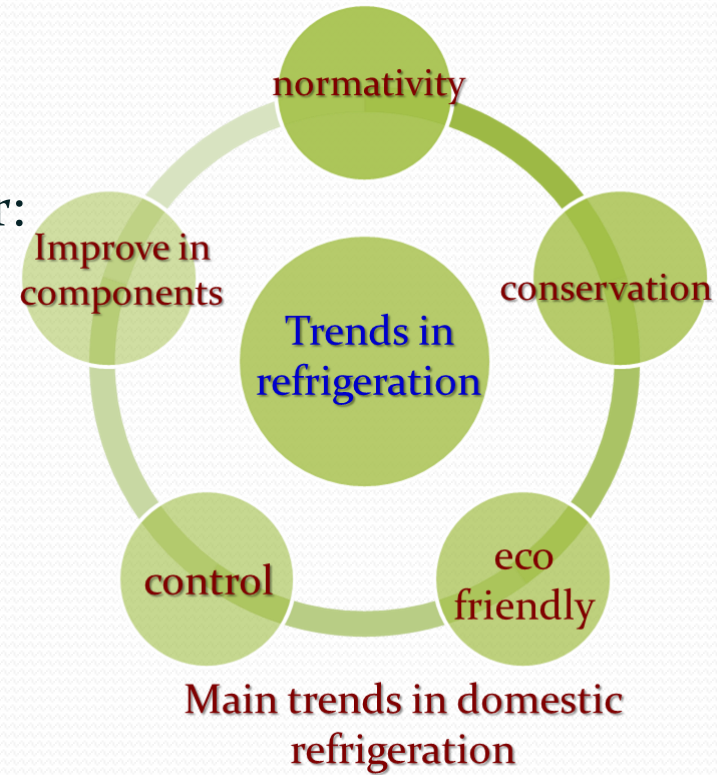
Refrigerator Seminar



Technical Expert Group Meeting

Technical Review and Promotion Survey:

- Over 40 technical publications in open literature surveyed in this period
- Major topics for EE promotion of refrigerator: cabinets improvement, refrigeration system improvement, inverter control, not-in-kind technologies (not suitable for practical implementation for product)



Project status-- Workshop I

ONE-DAY WORKSHOP: April 9, 2018

VENUE: Embassy suites, Hilton Hotel, Washington DC, USA

Four expert speakers and 18 attendants from 10 economies (including China; Indonesia; Japan; Malaysia; Mexico; New Zealand; Chinese Taipei; Thailand; Viet Nam; and USA) participated in this workshop



Group photo for the 1st Workshop on April 09, 2018 in Washington DC

- Shared the histories and benefits of policy implementation processes among APEC economies with successful experiences with refrigerator EE promotion.
- The discussion included the energy-saving technology, the relevance of technologies and EE benchmarks, EE management program design, market surveillance, laboratory test procedures and product certification, efficiency improvements, stakeholder's meeting processes, and subsidies.

Project status-- Workshop I

Outcomes

- ◆ In the past 30 years in the United States, the average selling price and energy usage of refrigerators have dropped by more than 70%, and the average equivalent volume of each refrigerator has increased by 50%.
- ◆ In Chinese Taipei, by successful promotion of energy labeling following MEPS in 2011, the high-efficiency product market share increased from 3% to 97% in five years.
- ◆ Although Japan's Top Runner program is voluntary, the Government guides the manufacturers to comply with and implement this policy tool, greatly improving the energy efficiency of refrigerators.
- ◆ The refrigerator efficiency improvement policies implemented in Australia and New Zealand have also achieved good results.

Project status-- Workshop II

ONE-DAY WORKSHOP: Sep. 11, 2018

VENUE: Le Méridien Chiang Mai Hotel, Chiang Mai, Thailand

Seven expert speakers and 45 attendants from 12 economies (China; Hong Kong, China; Indonesia; Japan; Malaysia; Mexico; Philippines; Singapore; Chinese Taipei; Thailand; Viet Nam; and USA) participated in this workshop



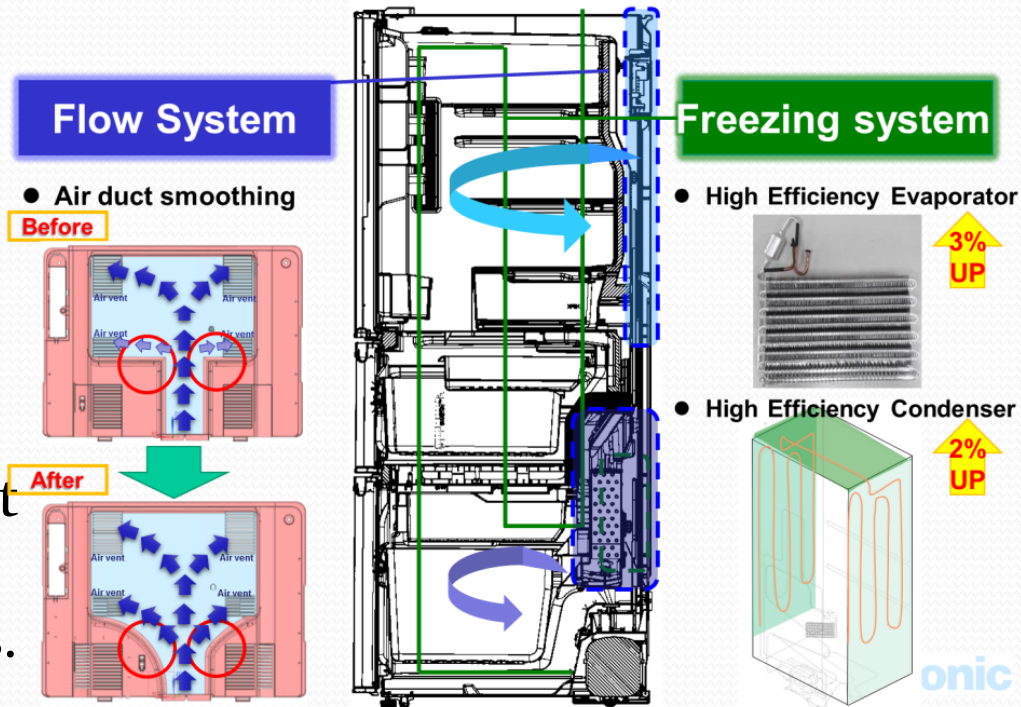
Group photo for the 2nd Workshop on Sep. 11, 2018 in Chiang Mai, Thailand.

- Invited experts from refrigerator manufacturers and testing institutions to share practical cases in energy efficiency improvement for refrigerators under EE regulations
- Efficiency improvement mechanism of the sales-side refrigerators in the successful case—including energy-saving technology development, energy efficiency management, test methods and other incentives

Project status-- Workshop II

Outcomes

- ◆ Workshop II integrated energy policy and refrigerator EE technology development, and the experts shared many practical pathways and related efforts to improve their product efficiencies under high efficiency energy requirements.
- ◆ Smart controls were also implemented by mobile APP for temperature control, food management, downloading recipes, ordering merchandise, etc.



Smart Life Smart App

- ✓ Adjustment
- ✓ Reminder
- ✓ Calculate
- ✓ Cooking relevant

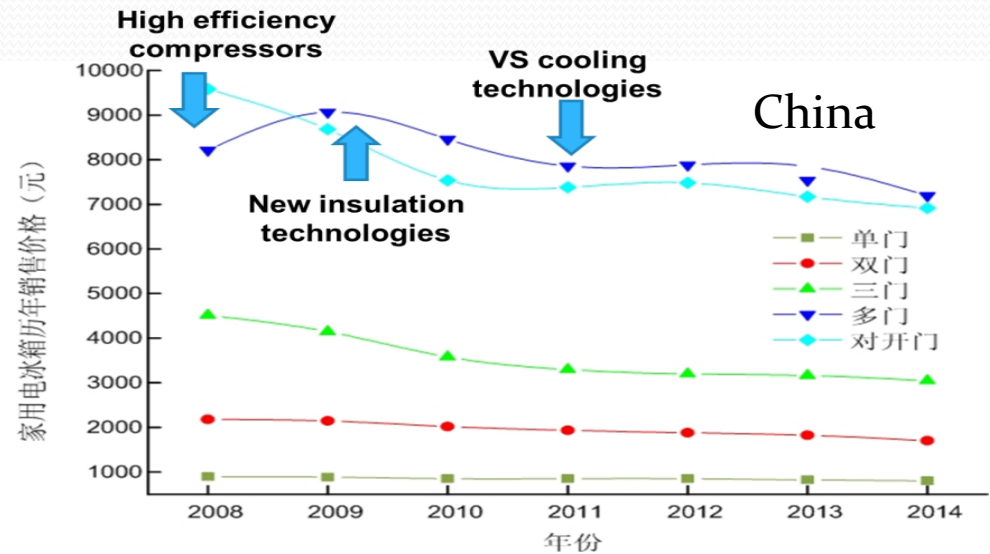
Panasonic Smart App TW

The image shows a hand holding a smartphone displaying the Panasonic Smart App interface. To the right, there is a white refrigerator with a smart control panel and a small white device connected to it. The text 'Smart Life Smart App' is prominently displayed, along with a list of features: Adjustment, Reminder, Calculate, and Cooking relevant. The Panasonic Smart App TW logo is also present.

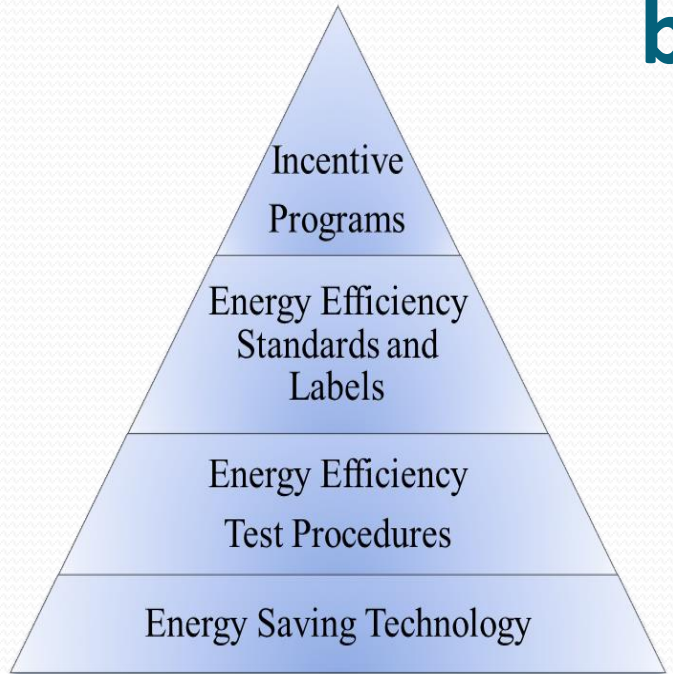
Project status-- Workshop II

Outcomes

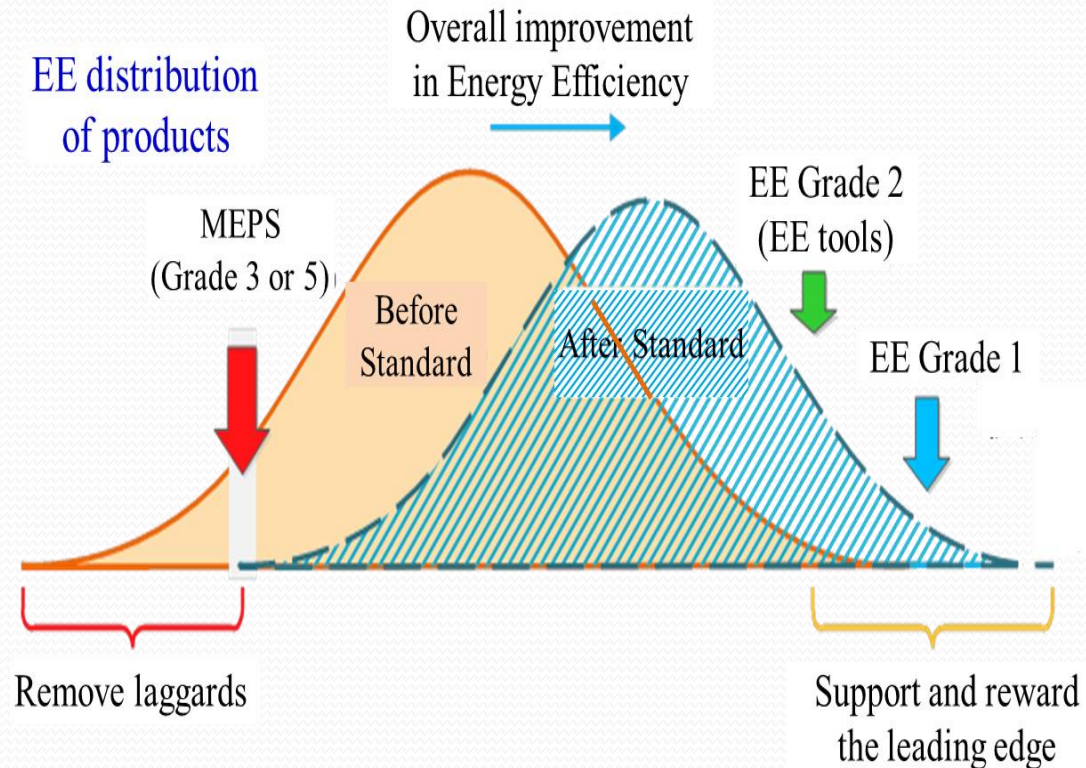
- ◆ Market shift to high efficient products by energy efficiency standards in China
- ◆ New energy saving technology, esp. for inverter control, for refrigerators is applied in Southeast Asia proposed by experts from Thailand, Viet Nam, and Malaysia.
- ◆ Standard harmonization for new version of IEC 62552 in the APEC region is on going.



Methodology and Market Transformation by EE Standards



Structure of Energy Efficiency
Management Program



‘Standards shift the distribution of EE models of sold in the market upward by eliminating a baseline for programs that provide incentives for “beating the standard.” Labels shift the distribution of EE models upward by providing information that allows consumers to make rational decisions and by stimulating manufacturers to design products that achieve higher ratings that the MEPS (Wiel et al, 2005)

Project Status -- **Outputs**

Refrigerator/Freezer Energy Efficiency Improvement in APEC Region: Review of Experience and Best Practices (EWG 07 2017A)

Output	Status
Project Work Plan and Structure of the Work Group	Completed (Jul. 2017)
Energy Saving Technology Seminar (Self-funding)	Completed (Nov. 2017)
Complete technical review and survey for refrigerator EE promotion in APEC region through a detailed questionnaire	Submitted (Oct. 2017) Completed (Apr. 2018)
Investigation report	Completed (Apr. 2018)
Workshop I	Completed on 9 Apr. 2018
Workshop II	Completed on 11 Sep. 2018
Final Draft Report	Completed (Oct. 2018)
Final Report	Completed (Nov. 2018)
Project Completion Report	Submitted on 26 Dec. 2018

Please link: <https://www.apec.org/Publications/2018/12/Refrigerator-Freezer-Energy-Efficiency-Improvement-in-the-APEC-Region>

Project Outcomes

Outcomes by Panel Discussion at the workshops:

- Request knowledge dissemination or training workshop for structural procedures of EE management, including pre-mark registration, testing and certification, marketing surveillance following some practical systems, i.e. USA Energy Star.
- Need some studies for the best practice on adaptation for policy change of energy efficiency regulation
- Practical testing harmonization of IEC 62552 by using laboratories' around robin test procedure among APEC region



THANK YOU



Asia-Pacific
Economic Cooperation