Japanese Policy and HVAC&R Industry Evolutions

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Osami Kataoka
Daikin Industries, Ltd.
for
JRAIA (The Japan Refrigeration and Air conditioning Industry Association)

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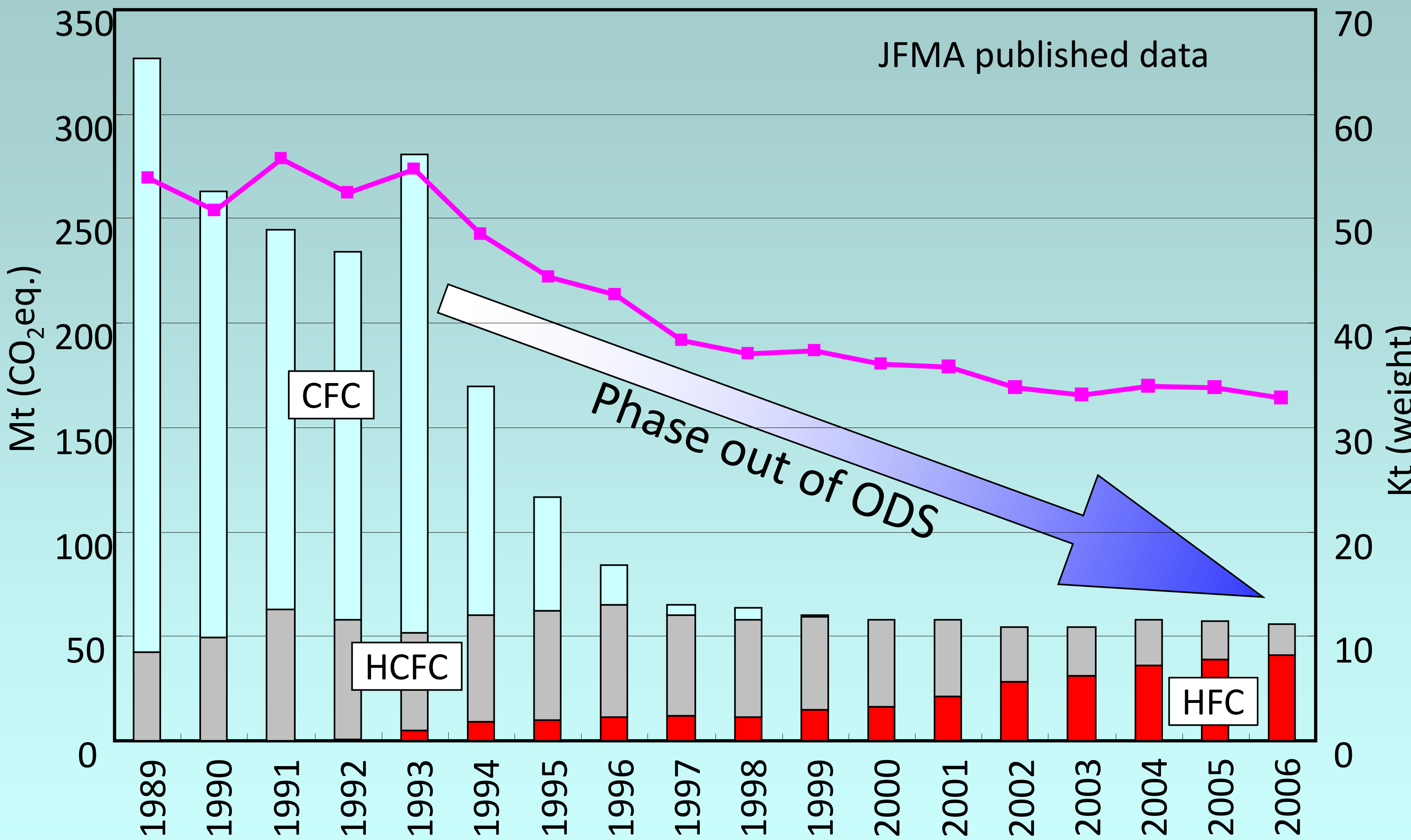
1.1 Japanese CFC, HCFC &HFC Consumption



Most of HFC refrigerants are introduced to phase out ODS. It also reduced GHG emission significantly, but this aspect is neglected in Kyoto protocol.

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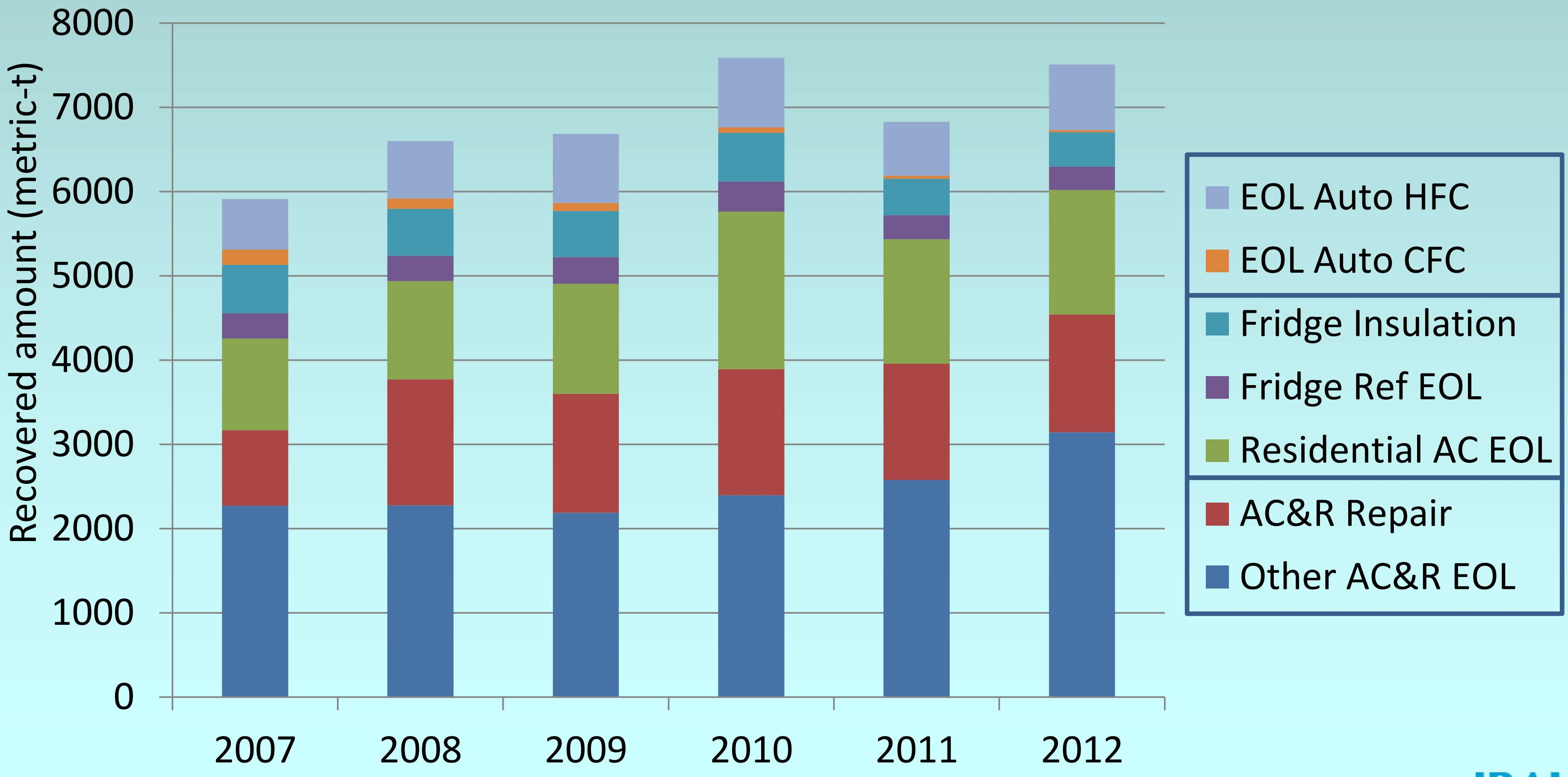
1.2 Recovery under Conventional Laws

- Significant amount is recovered, but recovery ratio is around 30% and is not rapidly growing.



2.1 Direction of the measures on Fluorinated GHGs

Added Points

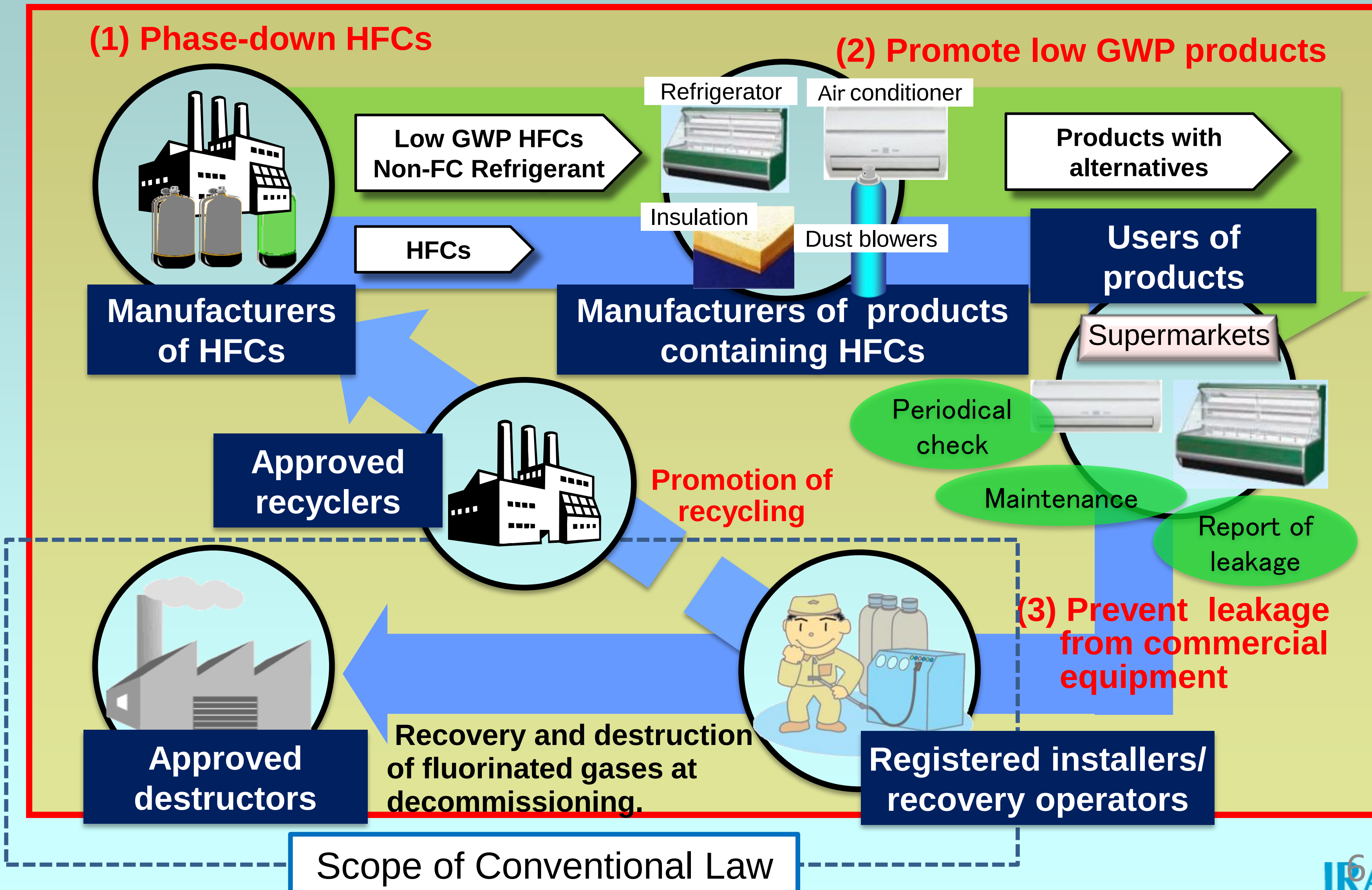
1. Promote equipment with low-GWP/non-fluorocarbon (conversion by OEMs)
2. Phase-down of fluorocarbons（supply reduction by gas producers/importers）
3. Prevent leak of fluorocarbon from commercial air-conditioning and refrigeration equipment in use（management by users）
4. Charge by registered operators and recycling by licensed operators

etc.

- **Revised law promulgation（June 2013）**
- **Implementation measures will be effective from April 2015**

2.2 Scope of the New Framework Law

New regulation encompasses whole life cycle.



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2. 3 Draft Implementing Acts

Product category (Some exemptions)	Target Year	Target GWP
Residential Split AC/HP excluding floor mounted and multi-split.	FY2018	750
Light Commercial split AC/HP up to around 20 kW capacity	FY 2020	750
Refrigeration unit including condensing units (Display cabinets)	FY2025	1500
Refrigerated Warehouse	FY2019	100
Auto Mobile Air Conditioner	FY2023	150

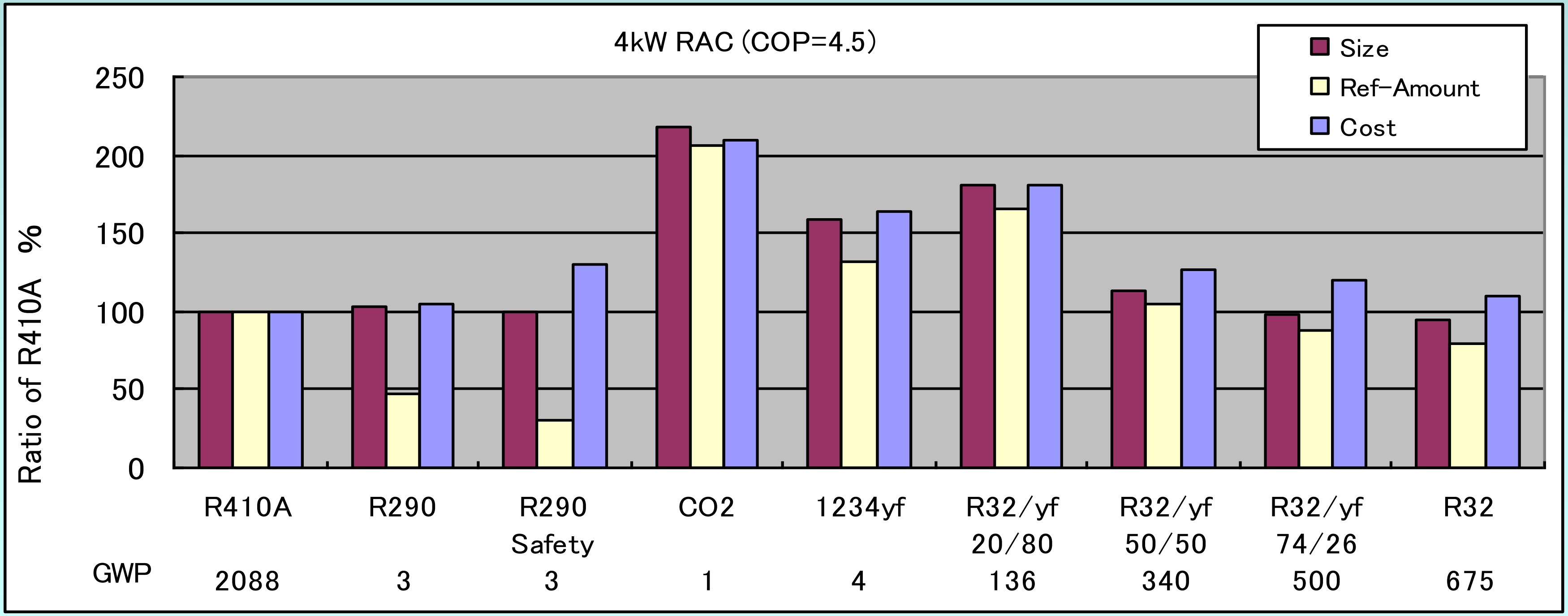
- Target GWP has to be achieved any manufacture or importer except SMEs in simple weighted average GWP. [$(GWP_1 \times n_1 + GWP_2 \times n_2)/(n_1+n_2)$]
- Phase down schedule of HFC supply will be determined according to these restrictions in use. [Bottom Up Approach]

3.1 Performance Evaluation

- Various studies of alternatives are carried out by 2010. Results are available on internet.

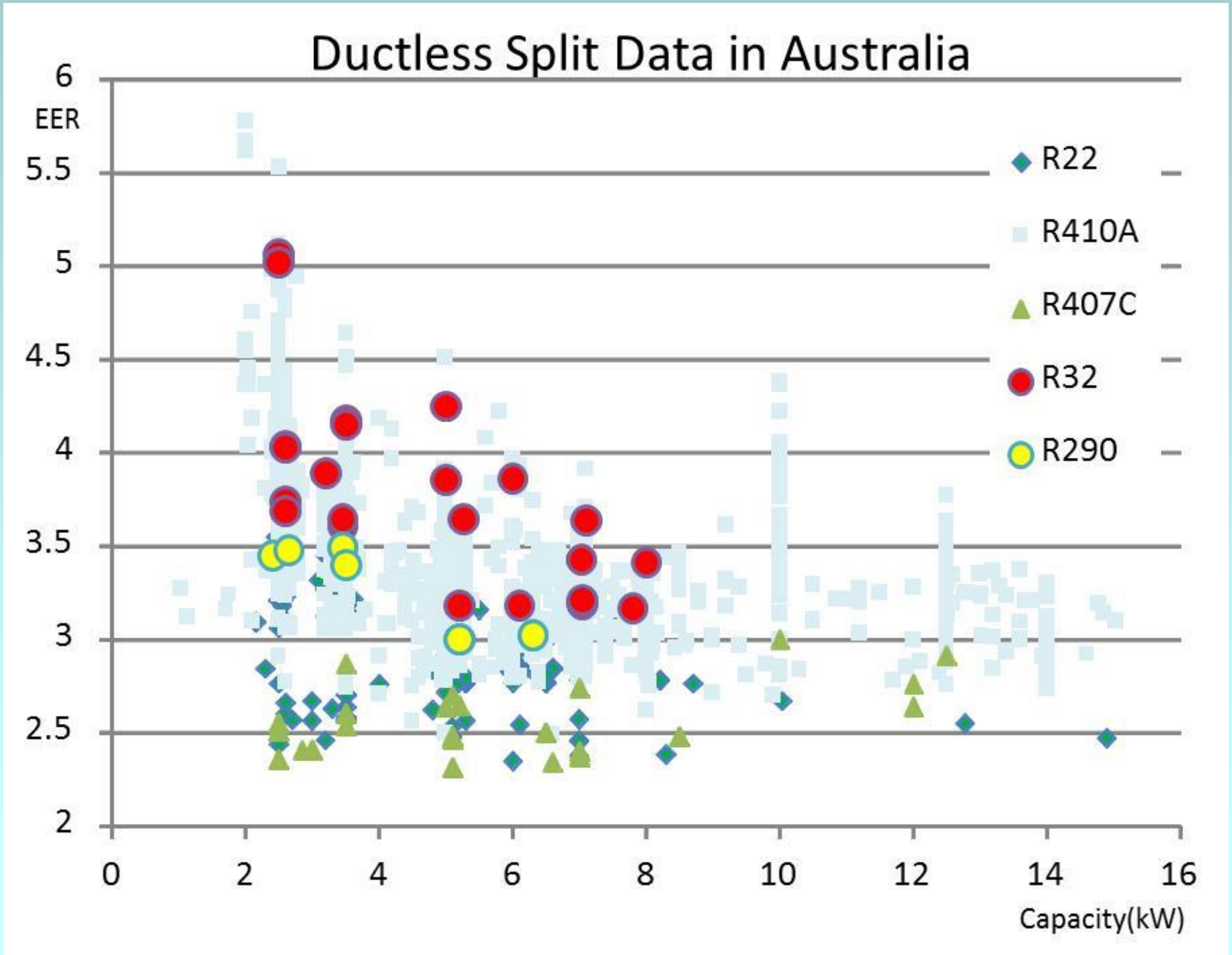
http://www.nedo.go.jp/english/publications_reports_reitou_ns_index.html

- Following is average of member companies' evaluation results of mini-splits at nominal condition to achieve COP=4.5.



3.2 EER in the Australian Market

Choice of Efficient refrigerant is necessary!



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4.1 Commercialization of R32

Indoor Unit	Outdoor Unit




- Risk assessment study concluded that R32 is acceptable for wall and ceiling mounted mini-splits.
- More than 2 million mini-splits with R32 had been sold in Japan by end of March 2014. Light commercial with R32 are also sold.
- Daikin, Panasonic, Mitsubishi Electric, Hitachi, Sharp, Corona and Fujitsu General commercialized mini-split with R32.
- Three companies almost phased out R410A from mini-splits of popular models.
- Reduction in GHG consumption will be >3Mt CO_2-eq in 2014.

4.2 Commercialization of non-FC refrigerant

SANDEN CO2 vending machines

MAYEKAWA Air Refrigeration System
ultra-low temperature (-50℃-100℃)

Panasonic CO2 Refrigeration Display cabinet

TOYO Engineering Works
CO_2/NH^3 Secondary Refrigerant Circulation System

Some products using non HFC refrigerants are already on the market

5. Summary

- HFC emission is increasing and would not be negligible.
- Conventional Law achieved significant recovery scheme, but not sufficient to mitigate HFC emission significantly.
- The New Framework Law to mitigate HFC emission with bottom up approach was promulgated in June 2013.
- Implementation measures will be effective from April 2015. Details are agreed or under evaluation/discussion.
- The performance study and risk assessment suggest R32 is one of acceptable options for air cooled residential split AC/HP. R32 products are commercialized in mass in Japan.
- Non-FC refrigerants are also commercialized various applications other than air conditioning, but not yet popular.
- Risk assessments of A2L refrigerants for refrigeration and larger AC/HP are ongoing.

End

Thank you for your attention!