



# **Experiences, key challenges and opportunities in demand side energy efficiency improvements**

## **The refrigerator case AM0070**

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# The India refrigerator case

- › Long Indo-Swiss-German cooperation in “greenfreeze” refrigerators with India under the Montreal Protocol
- › Twin methodologies AM0070 for energy efficient refrigerators and AM0071 for “greenfreeze” HFC free refrigerators developed with Godrej&Boyce and Videocon as project proponents under seco/UNIDO cleaner production programme by INFRAS/Southpole Carbon/ Winrock Intl. India
- › Manufacturer based approach: All refrigerator market structured in Direct Cooled (DC) and Frost Free (FF), stratified by storage volume classes

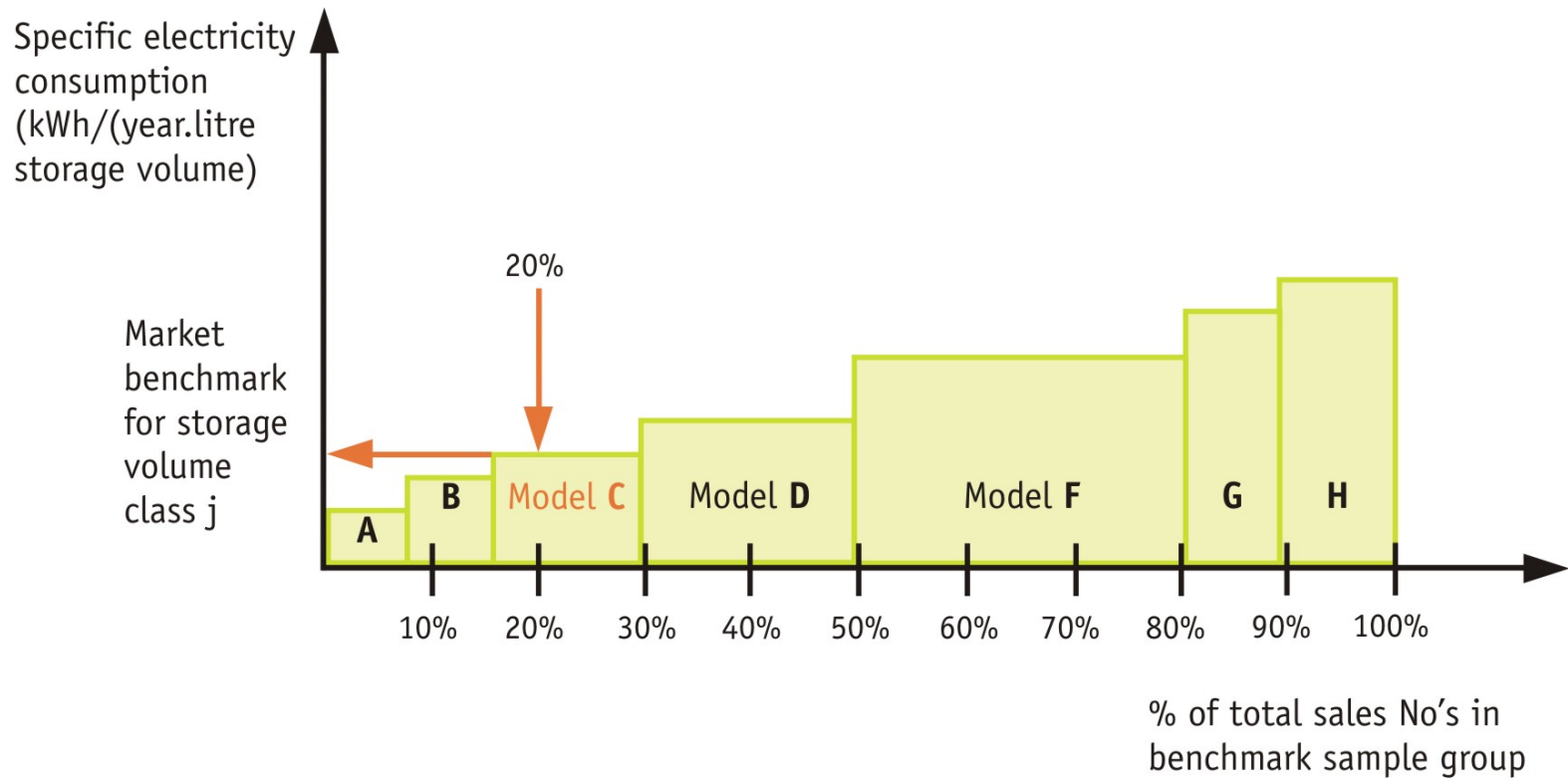
# Salient features of AM0070

- › Manufacturer based approach: Refrigerator market structured in Direct Cooled (DC) and Frost Free (FF), stratified by storage volume classes
- › Benchmark approach for determining baseline AND additionality
- › Market benchmark and manufacturer benchmark used
- › Energy consumption data based on standard testing (rated electricity consumption)

# Market benchmark

- › Most recent historical year ( $\leq 3$  years from project short year)
- › All refrigerator models sold in host country to be considered
- › Include all models per storage vol. class upto 90% of total sales = benchmark sample group
- › Min. 3 models per storage vol. class in sample group (DC/FF)
- › Select refrigerator model representing 20% lowest specific energy consumption
- › Market Benchmark to be updated annually through monitoring or with constant improvement factor (3,5%/a)

# Market benchmark for storage volume class j (FF or DC)

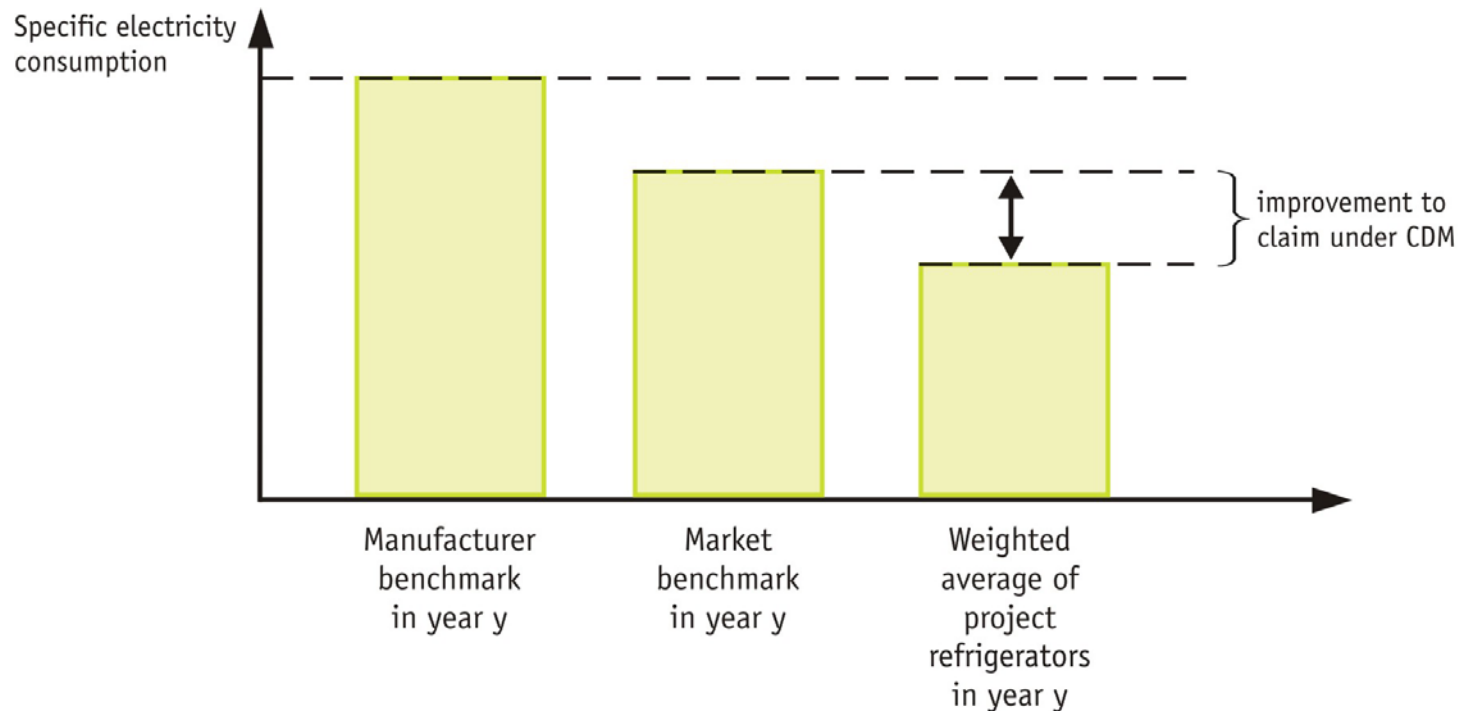


# Manufacturer benchmark for storage volume class j (FF or DC)

- › weighted average for specific energy consumption from all appliances produced by manufacturer in year y and belonging to storage volume class j
- › MIN value from historic period of past 3 years before project start
- › updated annually with constant improvement factor (3,5%/a)

# Relevant benchmark for storage volume class j (FF or DC)

› Benchmark for vintage v =  $\text{MINIMUM}(\text{Market BM}_{y=v}; \text{Manufacturer BM}_y)$





# Monitoring requirements

- › Number of units manufactured in different refrigerator classes and electricity grids
- › Emission factor (official “tool to calculate EF of electricity system”) and distribution losses (option of 5% default factor) of electricity grids
- › If annually updated benchmark  $\Rightarrow$  data for market benchmark
- › If no use of default correction factor (0.95) for actual against rated energy consumption  $\Rightarrow$  detailed field monitoring of energy consumption of appliances
  - › statistically signif. monitoring sample group ( $n > 60$ )
  - › minimum 3 years
  - › MIN value of 3 years to be used

# Conclusions

- › Marrakech clause “top 20%” leads to strong additional test in consumer durable markets – tends to focus on top end urban consumers not necessarily in line with “sustainability development” criteria of CDM and principle of optimizing GHG abatement across flows of consumer goods
- › Data and monitoring requirements are very demanding  
⇒ projects come to life only if supported by public funding (seco/UNIDO cleaner production programme India)
- › National circumstances matter. In India excellent cooperation with Bureau of Energy Efficiency