IPR impediments to the phase-down of HYDROFLOUROCARBONS

Room 16, April 7th, Thursday,
1:00 PM - 3:00 PM

Organized by: Centre for Science and Environment (CSE)

Objectives

- To examine the number and the nature of patents filed in India for the manufacture and use of HFO 1234yf and its blends in Refrigeration and Air conditioning sector, with focus on the MAC sector

- To analyse the scale of impediment posed by these patents to an eventual phase down of HFCs in the MAC sector

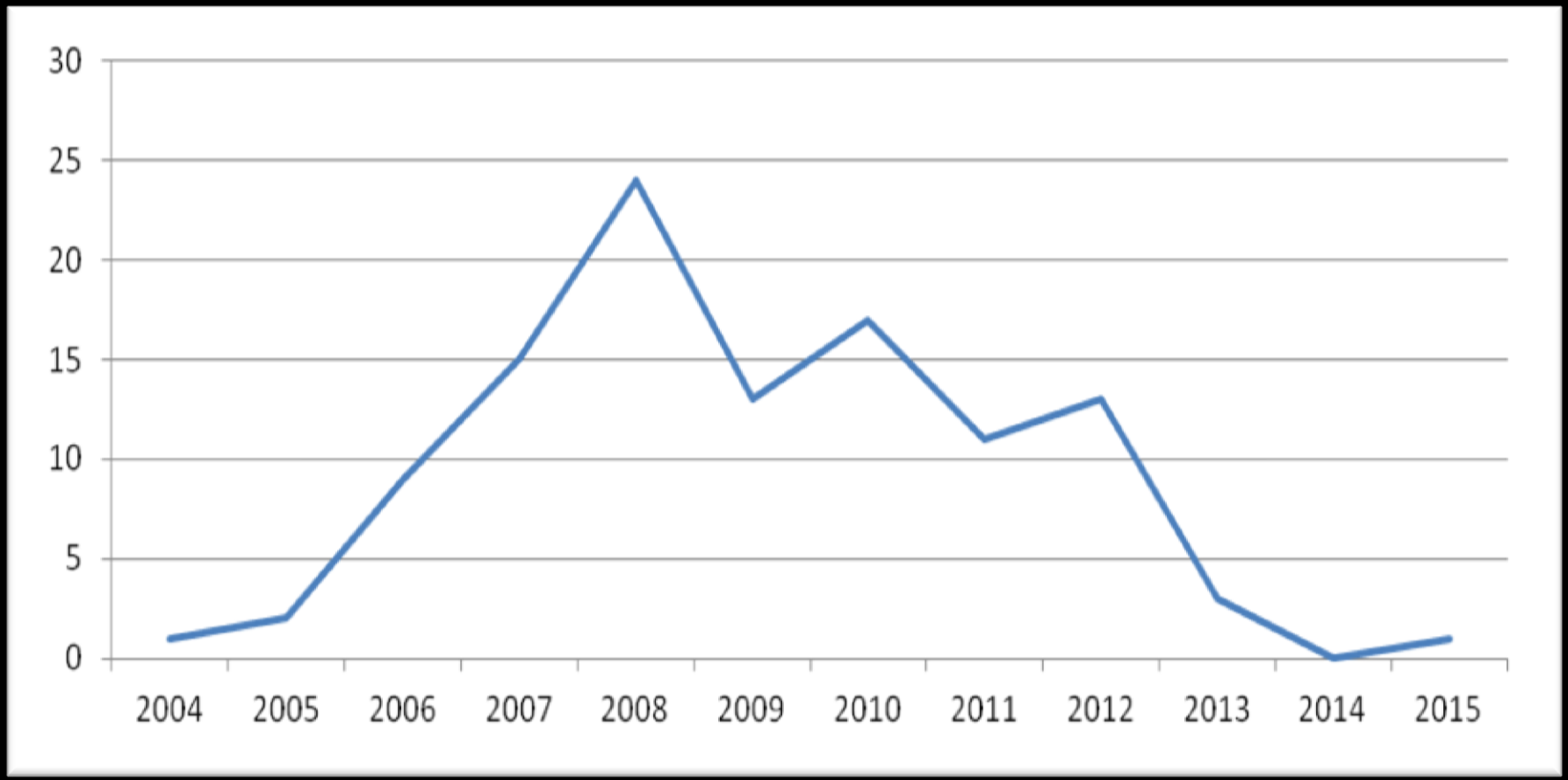
Methodology

- A patent search was conducted by India's premier patent research institute – CSIR
- The search used USPTO Espacenet, INPASS as well as subscribed value added patent databases such as Patseer, Questel Orbit, Thomson Innovation and PatBase
- The search included the use of keywords, concepts and related patent classification codes and combination thereof to retrieve the data from the various databases.
- The concepts used for searching the compounds under analysis included their Chemical Abstracts Registry (CAS) number and chemical names
- These concepts were combined with the patent classification codes for the application/use as refrigerant

IPR Study - Results

Type of Patent	Number of Patent
Total Patents related to HFOs in RAC sector including MAC	107
Patents related to the MAC sector	46
Process Patents on HFOs	20 filed, 3 granted
Equipment patents for HFOs in the MAC sector	11 filed, 0 granted
Application patents for HFO blends in RAC sector including MAC	75 (5 granted)
Application patents for HFO blends in the MAC sector	35 (2 granted)

Patent filed by year



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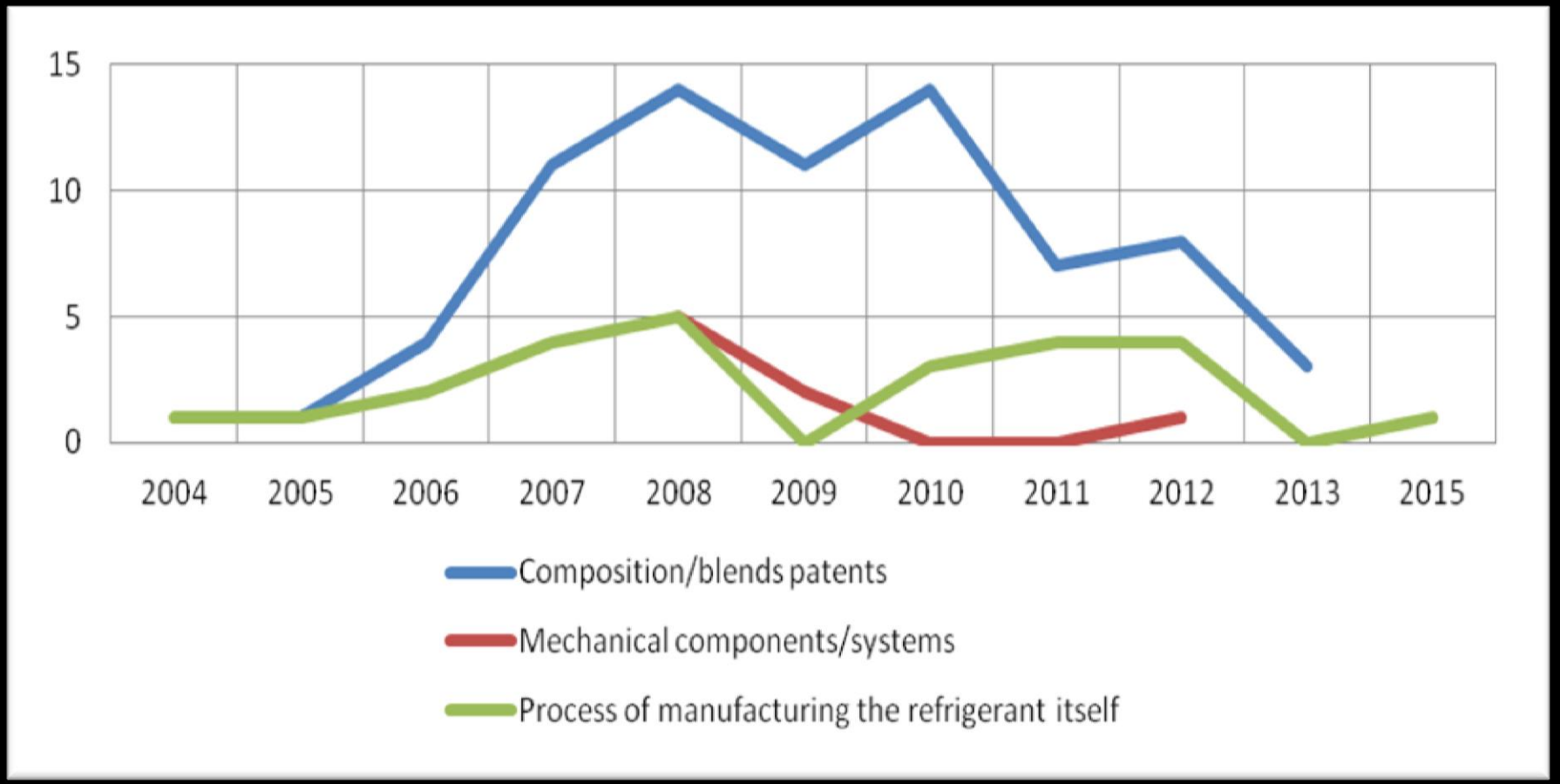
Patents filed by year and type (HFO 1234yf and blends)



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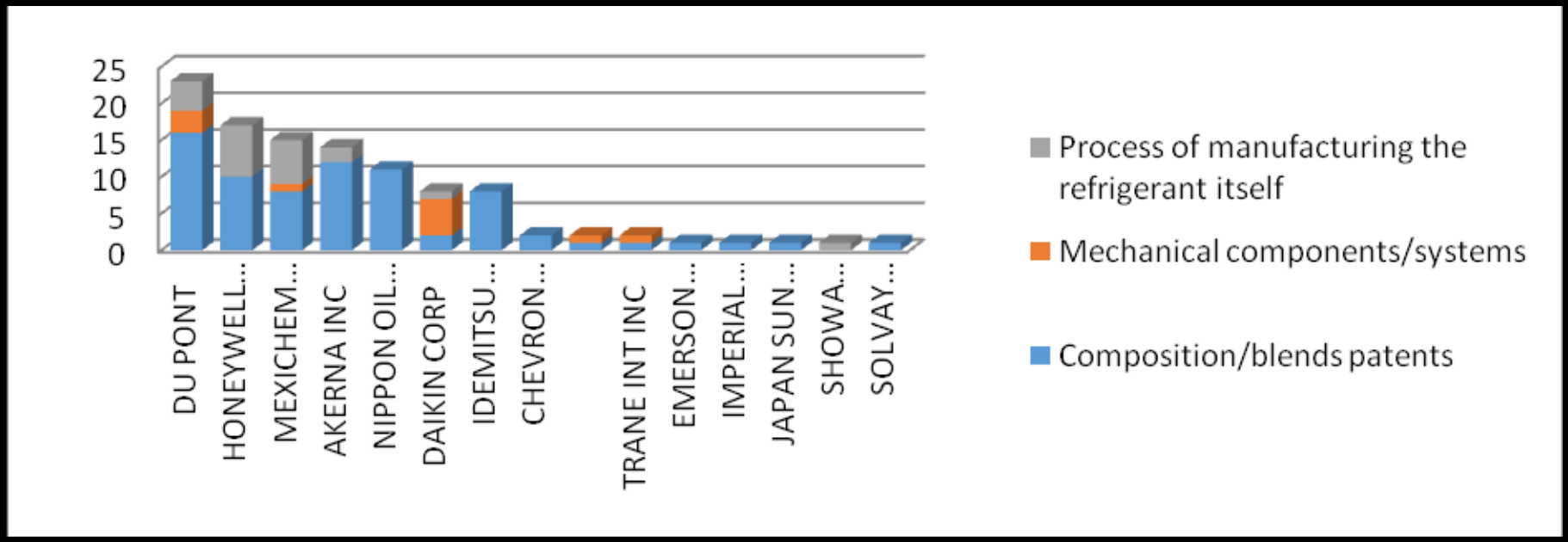
Patents on HFOs by Company



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Companies with most patents for HFO 1234yf and blends

Company	Number (filed)
Du Pont	15 (blends), 3 (mechanical), 4 (process)
Honeywell	9 (blends), 7 (process)
Mexichem	7(blends), 1 (mechanical), 5(process)
Arkema	10 (blends), 3 (process)
Nippon Oil	10 (blends)
Daikin Corp	1(blends), 4(mechanical), 1 (process)

Application patent: IN 250569

Granted to Honey well.

- **The independent claim covers the composition/blend encompassing a range of C3 and C4 fluoroalkene and its use in automobile air conditioning systems, this includes all variants of unsaturated hydrofluoroolefins like HFO 1234yf, HFO 1234ze, etc**

- **The claims preferably encompass R-134a, HFO-1234yf, HFO-1234ze in combination with each other and with other C2 or C3 fluorohydrocarbons, this includes HFC 1234a, HFC 152a, HFC 32, etc. The patent also restricts the use of other refrigerants like CO2**

Application patent: IN 250569

- **The patent claims include a broad range of percentages of each of the claimed HFO used in the composition. The percentage of HFO-1234yf which falls within the scope of the claims varies from 5% by weight to 99% by weight.**

- **Specific lubricants, flammability suppressant, operating temperatures, the phases of the individual components etc are also claimed.**

The broad application patent

- IN 250569 is a broad application patent which covers the use of HFO 1234yf by itself, in combination with most possible HFCs and lubricant in the Automobile air-conditioning sector in India
- Restricts the use of HFOs in a very broad range of combinations.
- Restricts the ability of enterprises in the sector to conduct R&D in the field
- The above patent was filed in 2006, granted in 2012 and expires in 2026

Application patent: 114/DELNP/2008

114/DELNP/2008 by Honeywell:

- The independent claim covers the composition/blend encompassing a range of C1,C2,C3,C4 and C5 fluoroalkene and its use as heat tranfer fluid, this includes all variants of unsaturated hydrofluoroolefins like HFO 1234yf, HFO 1234ze, etc in all processes

- The claims preferably encompass R-134a, HFO-1234yf, HFO-1234ze in combination with each other and with other C2 or C3 fluorohydrocarbons, this includes HFC 1234a, HFC 152a, HFC 32, etc. The patent also restricts the use of other refrigerants like CO2

Application patent: 114/DELNP/2008

- The patent claims include a broad range of percentages of each of the claimed HFO used in the composition. The percentage of HFO-1234yf which falls within the scope of the claims varies from 5% by weight to 99% by weight.

- Specific lubricants, flammability suppressant, operating temperatures, the phases of the individual components etc are also claimed.

Application patents: 3718/DELNP/2011

3718/DELNP/2011 by DuPont

- This patent protects the use of HFO 1234yf with several hydrocarbons in the following compositions (between 1 to 99% concentration) for use as heat transfer fluids, foam blowing agents and aerosol propellants:
  - HFO-1234yf and cyclopropane
  - HFO-1234yf and propylene
  - HFO-1234yf,HFC-152a, and cyclopropane
  - HFO-1234yf, HFC-152a, and propane
  - HFO-1234yf, HFC-134a and cyclopropane

Broad range patents

- This is a ‘ring-fencing’ strategy.
- No company can use HFOs/ blends without paying a license fees
- The idea is that these blends are only sold by few companies at monopolistic prices

Technology Transfer or outsourcing production

- HFO “technology transfer” is taking place in following ways:
  - Joint-ventures for which new companies are formed and both patent holders and developing country companies owning stakes. The only major variation is the arrangement for HFO sales:
    - Joint-venture company produces and sells HFO products within agreed quantities and specific markets/regions.
    - Joint-venture company produces and is compensated on production costs by the patent-holding partner company and the partner company sells all products manufactured by the joint-venture company.
- More recently, Navin Chemicals has signed agreement with Honeywell to produce HFO-1243yf and sell it exclusively to Honeywell.

Source: HFO IPR – Challenges and Opportunities Side Event, The World Bank, April, 2016

Conclude

- Producing HFOs is not an issue. SRF in India is planning to produce HFOs using its own proprietary process. Indian companies can also get license to setup manufacturing plant and produce
- But they can not sell it. They will need to come out with their own blends or take license from broad application patent holder or sell it to them.
- The real issue, therefore, is broad range application patent.

Way forward

1. Compulsory licensing/ challenge patents/ overturn patents
2. Phase-out in MAC sector when patent expires
3. MLF pays for patent, technology transfer and royalties
4. Something else???

Compulsory licensing

1. Compulsory licensing: Only done in exceptional emergency cases. HFOs in MAC cannot be called as exceptional emergency case. Even in 2030, HFCs in MAC will only account for 10% of total HFC consumption.
2. Challenge patent/ Overturn patent: Too theoretical. Not one HFO patent in India has been challenged so far. You need strong interested party with deep pockets and patience. Companies of developing world would rather make deals than challenge patents.

Phase-out in MAC sector when patent expires

- About 85 percent of the cars manufactured globally are manufactured in China, US, EU Japan, South Korea and India.
- About 75 percent of global car sales are concentrated within the top ten automobile manufacturers. The manufacturers are mostly based in Japan, EU, US and South Korea
- Only 15 percent of passenger car sales in India are by wholly owned Indian manufacturers (Tata Motors and Mahindra & Mahindra). The rest are MNCs.
- The concentrated nature of the automobile industry implies that a change in the prominent refrigerant used by the major automobile manufacturers will translate into changes all over the world.

Phase-out in MAC sector when patent expires

- The EU MAC directive restricts refrigerant use to those with a GWP of less than 150, thereby banning HFC-134a. This rule applies for new type-approvals from 2011 and for all new cars from 2017. Nearly all multi-national MAC suppliers already have developed systems with HFOs
- The US CAFÉ standards gives credit if a car has an efficient MAC system or uses a low-GWP refrigerant like HFOs
- An amendment to Montreal Protocol to phase-down HFCs would give a global signal to MAC industry to move to HFOs. Presently it is US-EU phenomenon; soon it will be global.
- So, the idea that MAC in developing countries could be the last sector to phase-out may not happen. They might the first sector in automobile importing A5 countries.

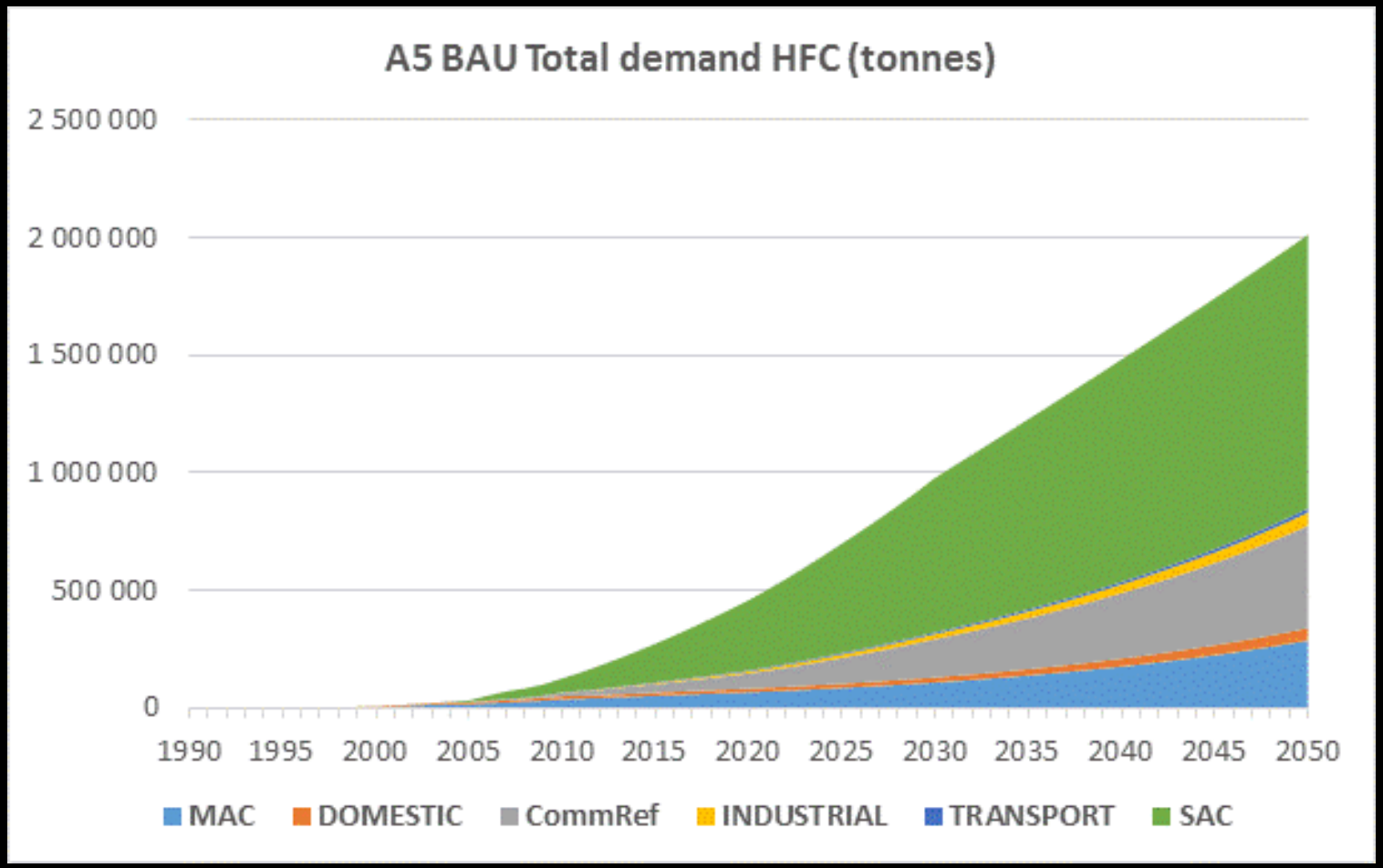
MLF pays

- What all will MLF pay and for how long?
- Incremental Capital and Operating Cost for Refrigerant manufacturing in developing countries – plant, license and technology transfer
- Incremental Capital and Operating Cost for MAC equipment -- plant, license and technology transfer
- Royalties/ Incremental cost for the use of chemicals

MLF pays

- Royalties/ incremental cost for the use of HFO/ blends in the MAC sector
  - Demand of HFCs by 2025 in A5: Approx. 100,000 tonnes
  - Assume that 50% is replaced by HFOs
  - Assume royalty/ incremental cost of $5.0/kg of HFOs
  - Annual Royalty/ incremental cost to be paid: $250 million/ year in 2025
- Can MLF afford this?
- The current annual budget is $160 million. Less than $100 million is for phase-out/down.
- If all goes to MAC, what will go to other sectors? What will servicing and small-scale industry get.
- The idea that MLF will pay for “cost of patents and designs and incremental costs of royalties”, needs to examined further

Is MAC sector the most important challenge?



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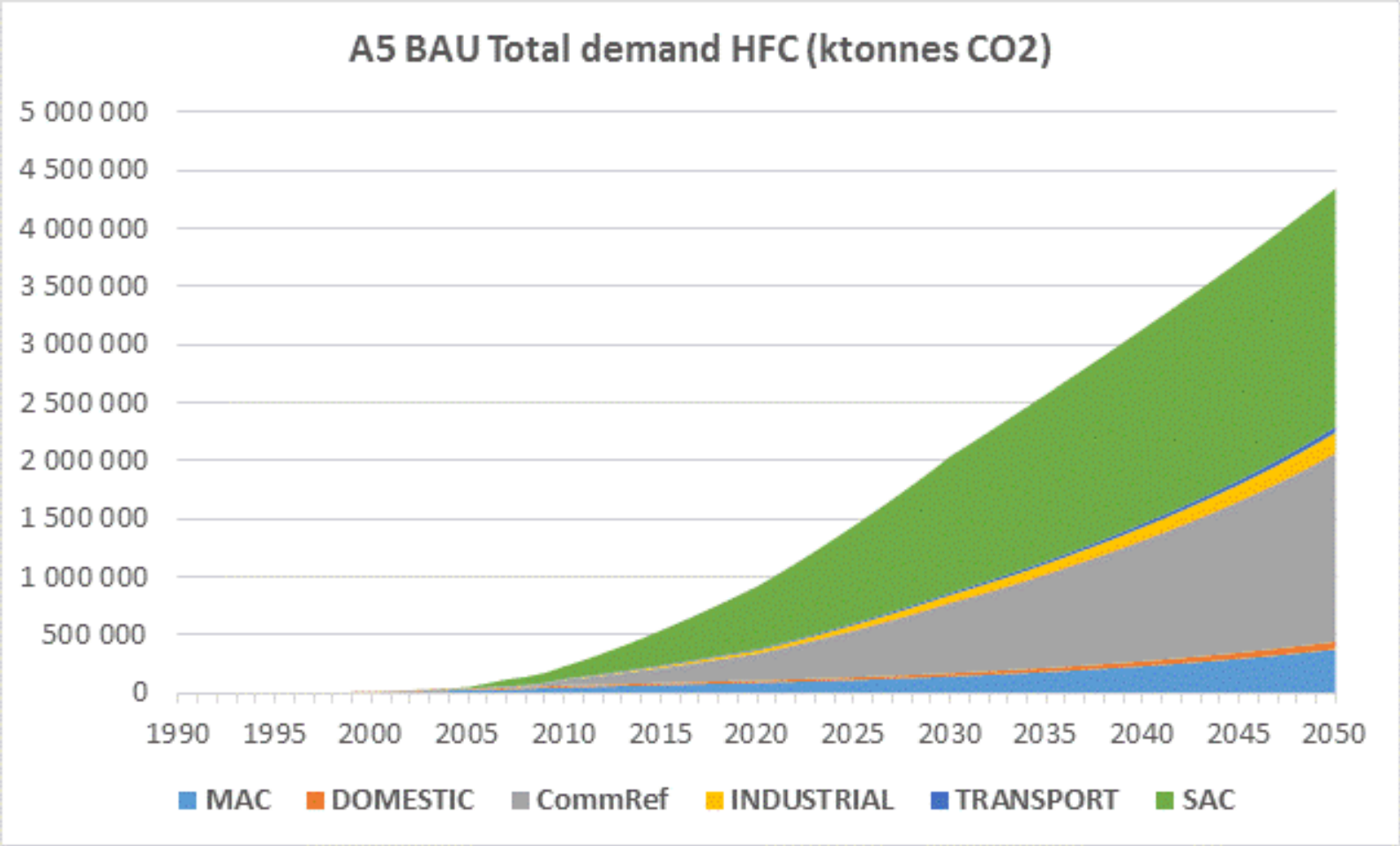

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An idea

- We find that there is disproportionate attention being paid to the MAC sector.
- IPR in the MAC sector taking attention away from other more important sectors like the domestic, industrial, commercial RAC sector
- Exclude MAC sector from the proposed amendment and phase-down schedule.
- The North Amercan proposal has a technology review provision. Institutionalise this provision to take a call on the inclusion of MAC sector in future.

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