



euramm^on
refrigerants delivered by mother nature



<< Status of Natural Refrigerant in Indian Market.>>
**Natural Refrigerants- Focus on Refrigeration
Perspective.**

by

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INDIA - NAMASTE



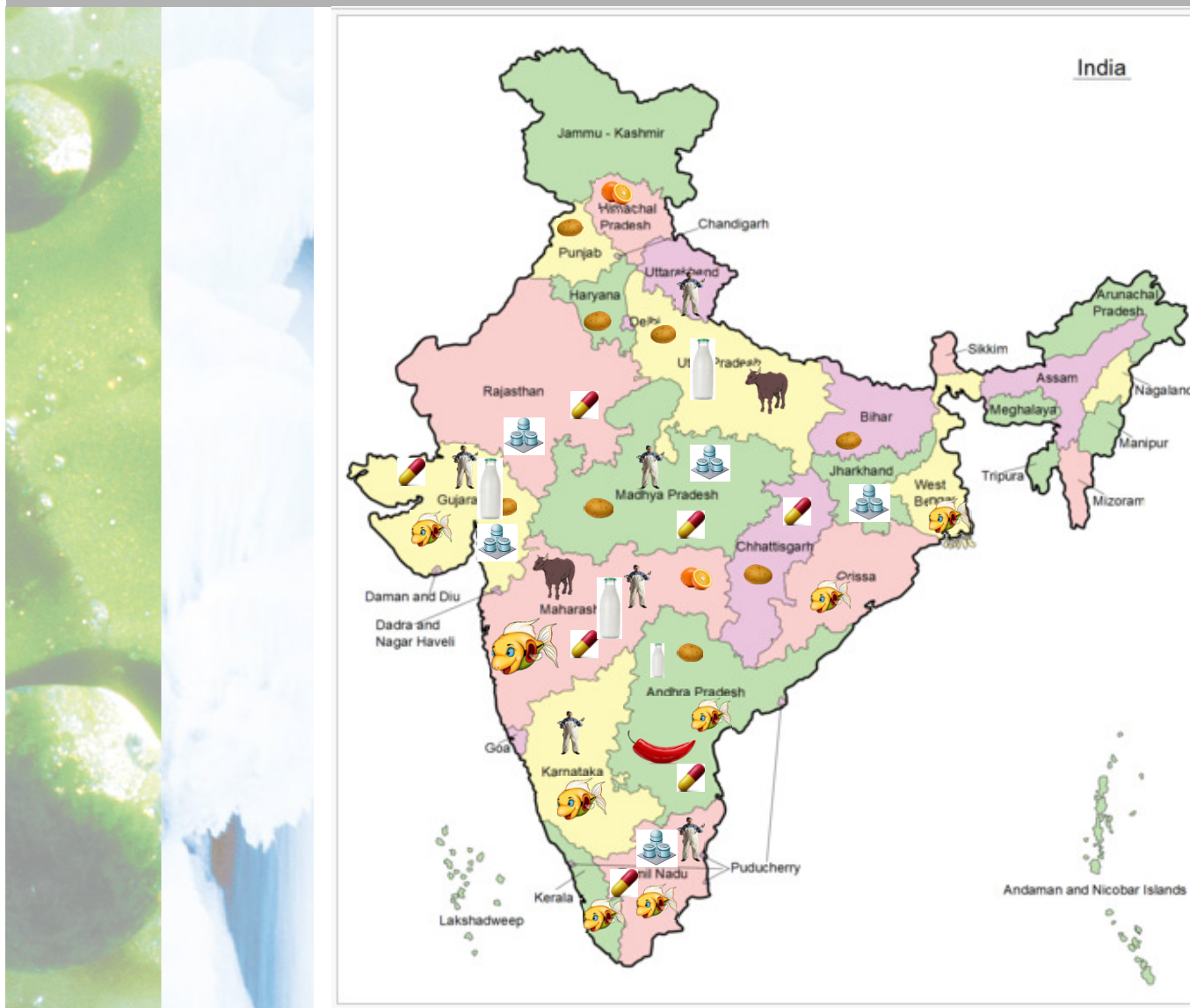
India : Why is it Important for Nat-Ref ?

Highlights :

- Area : 3.28 million sq km
- Arable Land : 2nd Largest after USA.
- Coastline : 8129 km.
- Land in Agriculture : 46.1%
- States: : 28 states
- Languages : 398
- Official Languages : 22
- World population compa : 17.31%
- Population : 1.22 Billion
- Population dependent on Agriculture : 70%
- Urban Middle Class : 350 million (Consumers)
- Climate : Tropical
- : 365 days Sunshine.
- : Diverse Agro Climatic Zones across India

INDIAN REFRIGERATION APPLICATION

Nat-Ref : Applications : SPREAD ACROSS THE COUNTRY






Application	
	Cold Stores
	Fish Freezing
	Meat
	Chilling App
	Chemical
	Pharma
	Milk






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GROWING.....




Nat-Ref : Major Applications : Commodity wise

Commodity	Mkt Size	Position in World	Future
Fruit	50 million MT 98% NH³	9th	 <p>41% of world mango 24% of Dry Fruits 30% of cauliflower 36% of Green Peas 18% Growth</p>
Vegetables	90 million MT 98% NH³	11th	<p>6000+ Cold Storages 90% for Potato 18% Growth</p>
Dairy / Milk	127 million MT 95% NH³	1st	 <p>35% Processed 200 Dairies 4% Growth</p>
Ice	4000+ 98% NH³		<p>Avg size of 20T</p>
Poultry	648 million MT 98% NH³	5th	 <p>70% organized 30% Unorganized 8% - 15% Growth</p>

Nat-Ref : Major Applications : Commodity wise

Commodity	Mkt Size	Position in World	Future
Meat	6.27 million MT 98% NH³	5 th	 200 Plants Restricted
Beverages Breweries Juice Prod	20.4 million cases 172 million cases 95% NH³		 17.2 % growth
Marine	8.13 million MT \$ 2.8 billion 80% NH³ 20% HCFC	3 rd	 287 Plants 35% Growth
Ice Construction	2 million MT 95% NH³		 6000+ Plants
Pharma Vaccines	\$ 9.4 billion	13 th	 250 Large Units 8000 Small Units 14% Growth

NatRef : Major Applications : Commodity wise

Commodity	Mkt Size		Future
Dispensers Water / Ice/ Drinks			R134a, R404A 20% Growth rate
Refrigerated Cabinets Chest Freezer			R404A R134a 15% Growth rate
Refrigerated Trucks			HFC R404A 4 Million T presently out of 104 million required. High Growth Rate expected

Why Food Consumption in India will affect Nat-Ref ?

- Food Consumption in India stands at 158 billion. growing at 7.8% per annum. (2007)
- Primary processed products constitute as much as 62 % of processed foods consumed with value-added products being the balance 38%.

Value Chain	Key Sectors	Market Size USD
Food- Unprocessed	Cereals, Fruits, Vegetables, Milk, Meat, Poultry, Fishes	73.82 billion
Food- Primary Processed	Packaged Fruits & Vegetables, Packaged Milk, Edible Oil, Milled Rice, Tea, Coffee, Sugar, Pulses, Spices & Salt	51.69 billion
Foods- Value Added	Processed Fruits & Vegetables (Juices, Jams, Pickles etc), Processed Dairy Products, Breads, Biscuits, Branded Oils Snack Foods, Beverages, Processed Meat	33.22 billion
Total Size		158.73 billion

Huge market potential for cold chain infrastructure

INDIAN REFRIGERANTS POSITION

India – Nutshell Refrigeration Markets (Industrial & Commercial)

Sub-sector	Application	Refrigerants 2012
Domestic Refrigeration	Household Refrigerators And Freezers	HFC-134a, HFC-407a, HFC-404
Commercial Refrigeration	Refrigerated Cabinets Water Coolers	HCFC-134a, HFC-407a, HFC-404
	Ice-candy machines Walk-in coolers	HCFC-22, HFC-134a HCFC-22, HFC-134a (refrigerants), HFC-404
Industrial Refrigeration	Cold Storages Process Chillers	HCFC-22, HFC-134a, Ammonia HCFC-22, HFC-134a, Ammonia
Transport Refrigeration	Perishable Transport	HCFC-22, HFC-134a,
Air Conditioning	Chillers Automotive-air conditioning	HCFC-123, HFC-134a, HCFC-22 HFC-134a,



INDIAN GOVERNMENT INNITATIVE

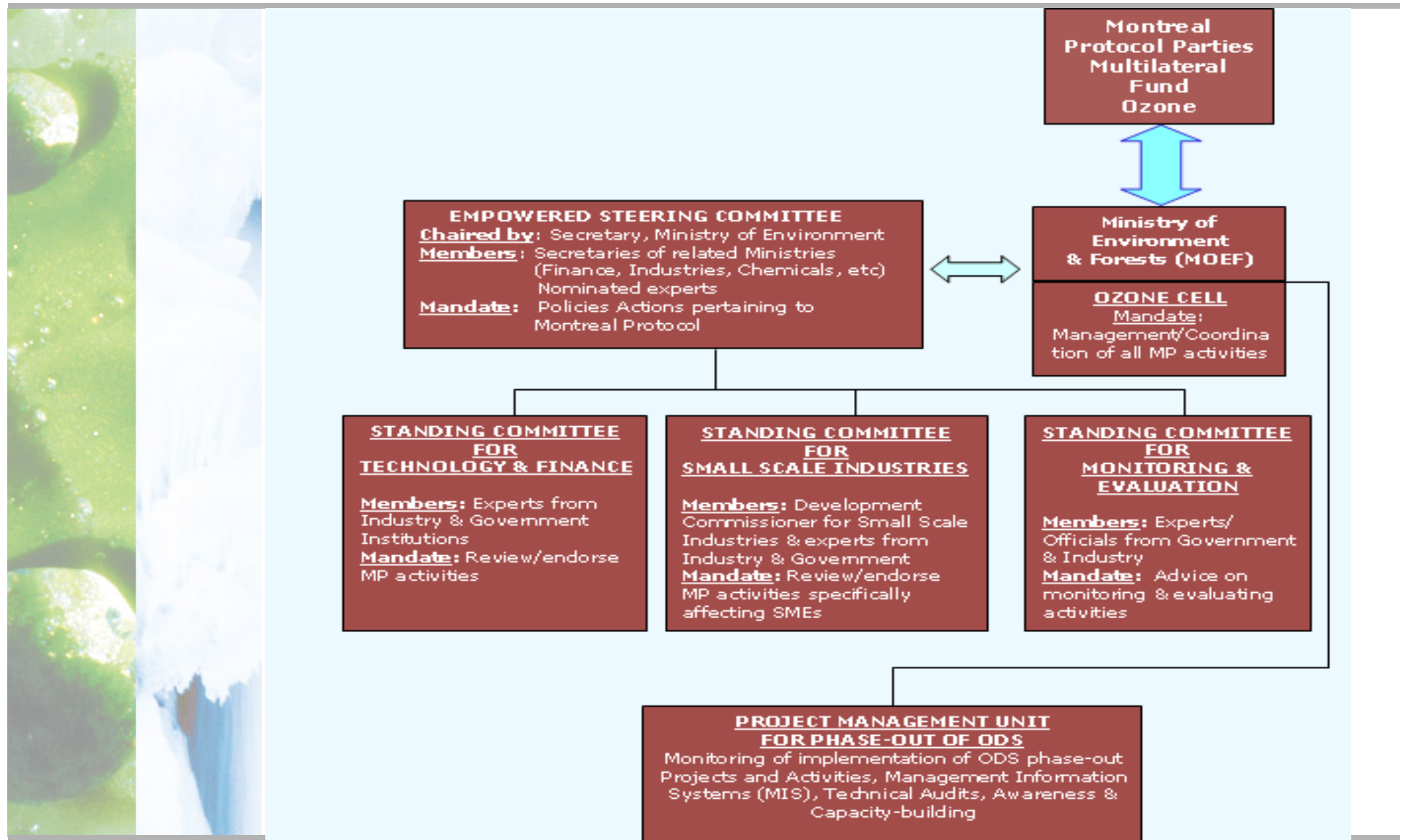
Indian : Government Initiative.

- Significant progress has been made in eliminating Ozone Depleting Substances since the entry into force of the Montreal Protocol in 1987.
- India became party to **the Vienna Convention for the Protection of the ozone layer on 19th June, 1991** and the **Montreal Protocol on Substances that Deplete the ozone layer on 17th September, 1992**.
- India was classified as a party operating under Paragraph-1, Article-5 of the Montreal Protocol and thus qualified for technical and financial assistance, including transfer of technology, through the financial mechanism of the Montreal Protocol.

INDIA'S COMMITMENT TO THE MONTREAL PROTOCOL

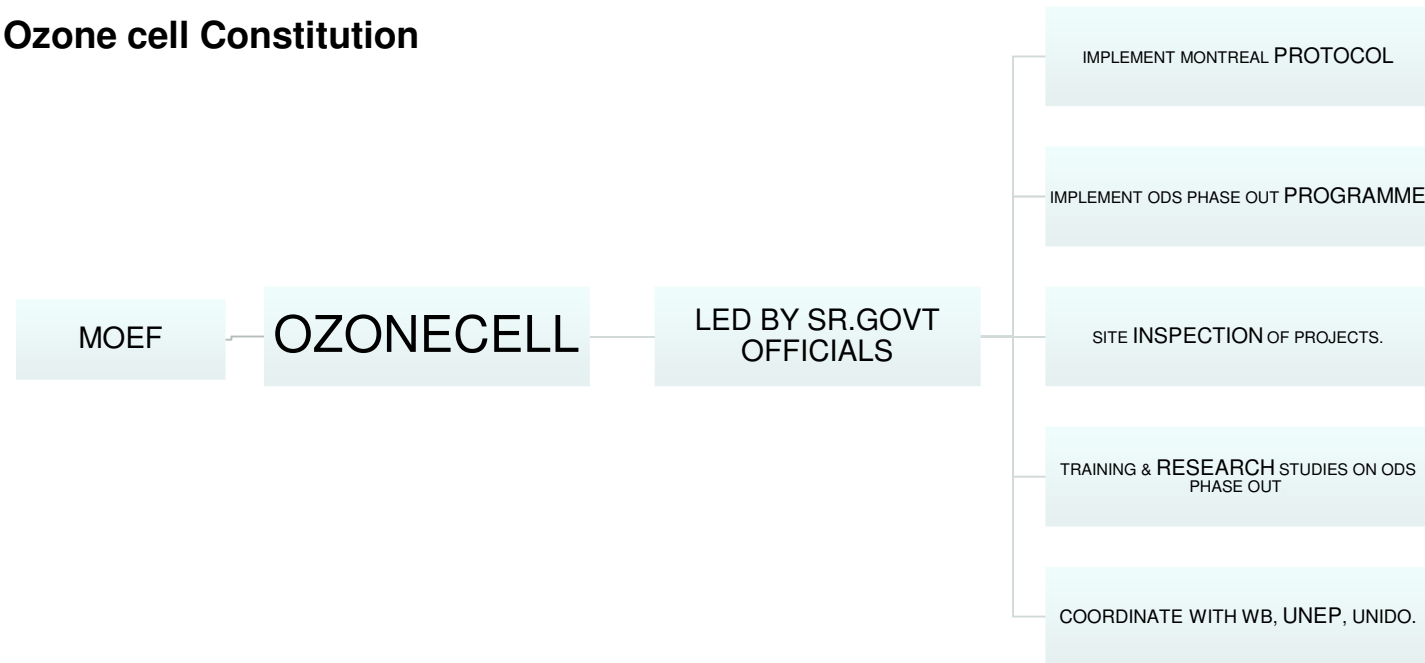
Year	Status	
18-03-1991	India Party to Vienna Convention.	
19-06-1992	India Party to Montreal Protocol.	
19-06-1992	London Amendment	CFC PHASEOUT 2010 HALONS PHASEOUT 2010 HCFC PHASEOUT 2040
03-03-2003	Copenhagen Amendment	HCFC / HBFC / METHYLBROMIDE AS CONTROLLED SUBSTANCES.
03-03-2003	Montreal Amendment	LICENCING SYS FOR IMP / EXP OF CONTROLLED SUB BY 1-1-2000
03-03-2003	Beijing Amendment	CONTROL MEASURES FOR MFG OF HCFC , DEVELOPING COUNTRIES CAN MFG ADDITIONAL 15% FOR DOMESTIC MKT.

Institutional Framework for Implementation of Montreal Protocol



INdia NatRef Ozone Cell : Organization Structure

Ozone cell Constitution



Projects Being Implemented by Ozone Cell In India.

- CFC Production Phase out
- Halon Production Phase Out
- Foam Sector Phase Out.
- Commercial Refrigeration (Sector)
- National CFC Consumption Phase out Plan (NCCOPP)
- Aerosol Sector Phase out.
- HCFC Phase out Management Plan.

UNEP : United Nation Environment Programme

PRODUCTION & CONSUMPTION CONTROL SCHEDULE AS PER MONTREAL PROTOCOL


ODS / Baseline (Prod. & Cons.)	2005	2007	2008	2010	2015	2030
CFC – P(22588 MT) C(6681 MT)	50 %	85 %	100%	NA	NA	NA
Halon – P(95 MT) C(260 MT)	50 %	-	-	100 %	NA	NA
CTC – P(11553 MT) C(11505 MT)	85 %	-	-	100 %	NA	NA
MCF – P(Nil) C(1467 MT)	30 %	-	-	70 %	100 %	NA
MeBr – P(108 MT) C(-)	20 %	-	-	-	100 %	NA
HCFCs**	-	-	-	-	10%	100 %

Baseline of HCFC : Production and Consumption average of 2009 and 2010

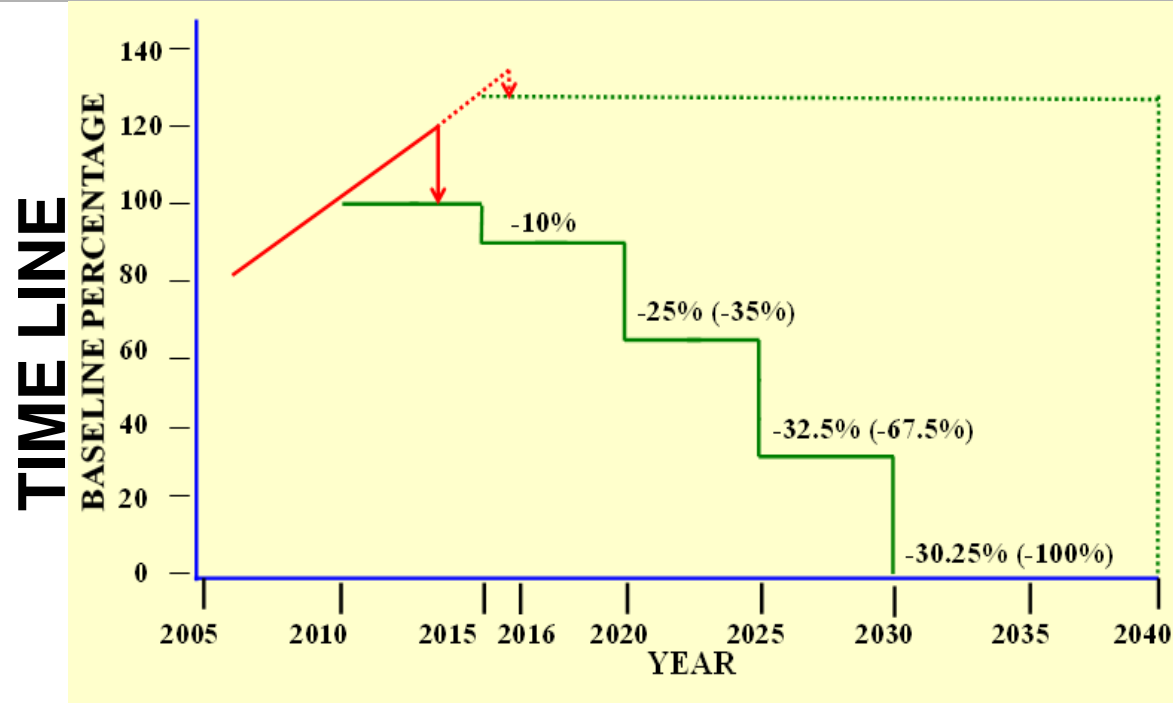
National ODS Legislation

1. Mandatory registration for production, sale and use of ODS.
2. Mandatory registration of manufacturer, importer and exporter of Compressors
3. Registration for recycling, recovery and destruction of ODS Authorities and procedures for registration are defined.
4. Import and Export of ODS are subject to License issued by the Directorate General of Foreign Trade (DGFT) on the recommendations from MOEF.
5. Registration of enterprises using ODS has been extended.
6. Production, import and export of CFCs, CTC and halons is banned from 1st Jan, 2010 except for feedstock applications if any.

National ODS Regulations

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1. Regulation on production and consumption of ozone depleting substances.
 - i) Prohibition on export to or import from countries not specified in Schedule VI (*not Party to the Montreal Protocol*).
 - ii) Ozone depleting substances are to be exported to or imported from countries specified in Schedule VI under a license.
 - iii) Regulation of the sale of ozone depleting substances.
 - iv) Regulation on purchase of ozone depleting substances.
 2. Regulation on the use of ozone depleting substances.
 - i) Prohibition on new investments with ozone depleting substances.
 - ii) Regulation on import, export and sale of products made with or containing ozone depleting substances.

HCFC Phase –out Schedule for Article 5 Parties



- Baseline : average of 2009 and 2010 production and consumption
- Freeze : 2013
- 10 % reduction of baseline in 2015
- 35 % reduction of baseline in 2020
- 67.5 % reduction of baseline in 2025
- 100% phase-out in 2030

Allowing for servicing an annual average of 2.5% during the period 2030-2040



Indian Nat- Ref Advantage

India Nat-Ref Advantage : Ammonia

- Most Easily Available all across India.
- Cheapest of the Refrigerant only :

REFRIGERANT	COST / Kilogram (USD)
NH3	\$1 / kg
R 134a	\$ 12 / kg
R 404A	\$ 9.2 / kg
R 22	\$ 12 / kg
R 410	\$ 7.8 / kg

- Known Refrigerant to Users / Operators / Sellers.
- Compatible Machinery for Refrigeration easy availability at lower price.
- Every Technician is knowledgeable.



India Nat-Ref Challenges

CHALLENGES GOVERNMENT END IN PHASING-OUT OF HCFCs

- Period for change-over is short especially for first stage reduction targets
- Approximately 40% reduction of the base line consumption in few years (2013/2015)
- Technical options are still emerging. Industry to look for low GWP long term solutions.
- HFCs are the main options to HCFC for most of the applications in refrigeration and air-conditioning
- Low GWP options are also being under investigation
- HFCs are the potent Green House Gases (GHG) and emissions of these gases are controlled under Kyoto Protocol

India Nat-Ref Challenges

Ammonia Systems

Technical (Refrigeration Engineering) Non Availability of good Engineered Systems.	72%	
Technical (Safety Engineering) : No Consideration on System Safety Front. Max problem of Charge Leakage. Not acceptable where dense human settlement.	72%	
Supply & Availability (Materials , Equipment's , Components , Fluids) Need to make it affordable for India.	72%	
Commercial (Investment ,Profit , FDI) Need to make plant Profitable , based on Volume of output considered.	62%	
Information Resources (know-how , guidance & training)	48%	
Regulations and Standards for Usage	30%	
Economic Costing for viability	30%	
Psychological acceptance by the end user	25%	



India Nat-Ref Education

India Nat-Ref Education

- Majority People learn on the Job.
- Basic Training available to become Apprentice at ITI .
- Handful of Institutes only.
- Post Graduate Diploma on Cold Chain Business Management at Symbiosis.
- Diploma in Refrigeration & Air Conditioning Technician Course at Tamil Nadu Open Univ.
- National Horticultural Board Organizes – Training to Operators & Consultants in co storages and cold chain business – Basic but effective.
- ISHRAE Course on Advance Diploma on Refrigeration & Air-conditioning.
- Periodic Workshops AC&R Conducted by:
- ISHRAE / ASHRAE / AAR / AIACRA



India Nat-Ref Opinions

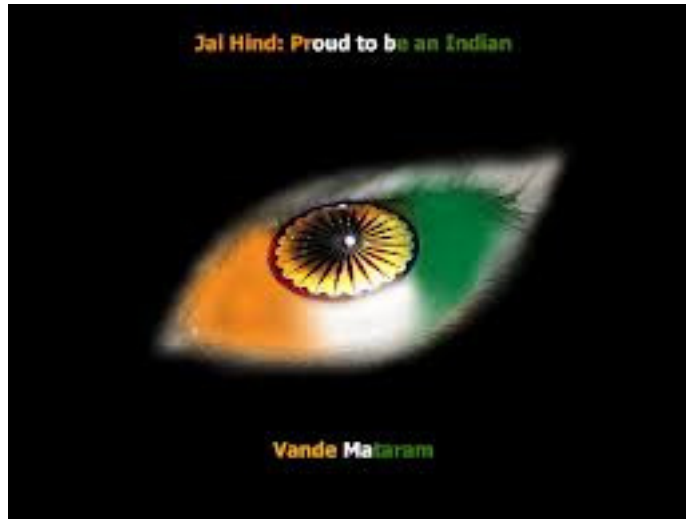
India Nat-Ref Opinions

	YES	NO
Awareness of the need to switch to National Refrigeration Based Systems to save earth?	100%	0%
Awareness of technological availability and Manufacturers to supply eco-green systems?	81%	19%
Interest in knowing about Green system & Technology?	100%	0%
Super Markets using CO2 Systems are getting acceptability in India	62%	24%
Jump from HCFC's to safer Refrigerant's for India bypassing HFC ?	72%	28%

India Nat-Ref Opinions

What is the anticipated potential for such systems in India (particularly for Supermarket Application) ?

- Food Supermarkets are yet to take off in India . In most family owned retail stores , the initial cost weighs heavily on buying decisions. Big players like Coke / Pepsi , can pursue their global philosophy on Nat-Refs.
- Great Potential in Hotel Industry & Supermarkets.
- Modest Potential : We are just shifting to shopping malls concept from corner stores for many commodities but farmland produce.
- Cascaded systems with NH₃ ,have still not taken roots. Problems are anticipated for high ambient CO₂ system performance.
- Potential for Air Conditioning in Supermarkets is high.
- Supermarkets with Foreign tie-ups will bring in global Technology.
- Service availability and technical Knowhow for maintenance needs to be upgraded.



THANK YOU