Energy efficiency policy measures and their impact on Cold Storages in India

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clasp

Efficient Appliances for People & the Planet

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Efficient cold chain have multiplier effect: reduced food losses, environmental impact and enhanced farmers' income

Agriculture is a critical pillar of India's economy

- Contributing ~20% of GDP and providing livelihood to 44% of population
- Largest producer of milk and dairy products
- 2nd largest producer of fruits and vegetables, fish

However

- Only 4% of the country's produce benefits from cold-chain
- Approximately 30% of fruit and vegetables are lost or wasted each year
- Only 1% of India's horticulture produce is exported

Efficient cold chain can

- Reduce harvest and post harvest losses which are estimated to be around INR 440 billion annually
- **Reduce food loss**
- **Create a positive ecological / environmental impact**
- **Directly impact and enhance farmers' income**

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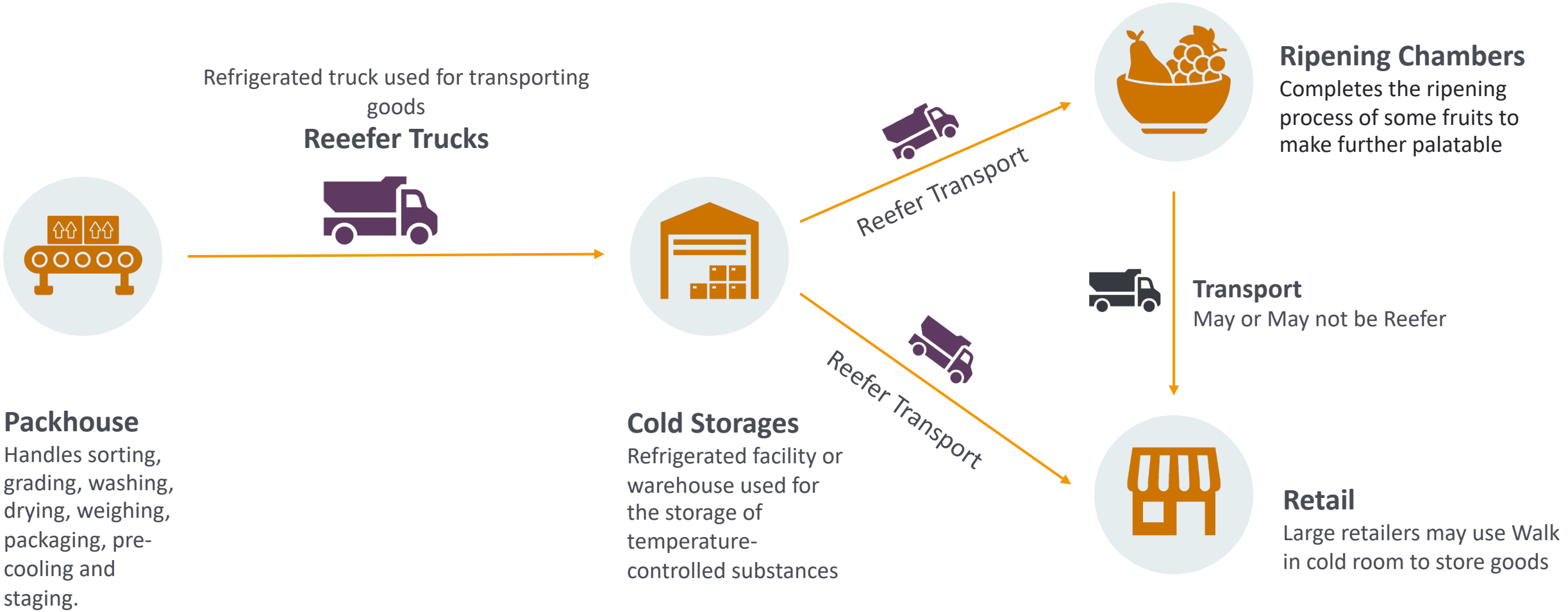
Cold Chain: Overview of key components



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Cold Chain capacity in India: 2017-18

Total Installed : 35.19 Million Tonnes (MT)

Cold Storages, 99.4%, 35 MT

Pack houses: 0.015 MT, 0.01%
Reefer vans: 0.135 MT, 0.3%
Ripening chambers: 0.04 MT, 0.1%

By Technology

Vapor Compression Cycle, 95%

5%

Sorption
Evaporative cooling
Ice making

By refrigerant

Ammonia based, 74.6%

- 75% of the cold storage capacity is Ammonia based, these are largely bulk cold storages
- Ammonia based systems are centralized systems consisting of a compressor, condenser, evaporators and expansion valves
- Ammonia based systems are dominated by the unorganized players (80-85%), where different components such as (compressors, evaporators, condensers, controls etc.) are procured from different vendors and are assembled at site

HFC/HCFC based, 25.4%

- Pack house, reefers and ripening chamber use HCFC/HFC based refrigeration systems only
- ~25% of the cold storage capacity is HCFC/HFC based, largely modular type

Based on ICAP study, capacity factor for cold chain facilities taken from NCCD

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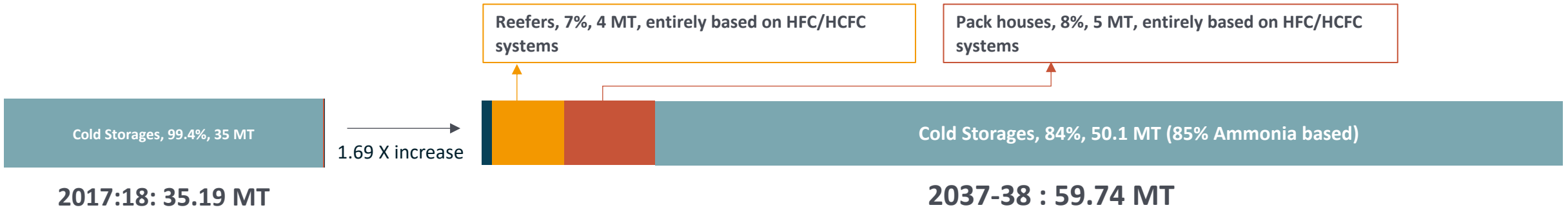
Cold Chain Capacity – growth estimates



Takeaways

	Market	Technology

Cold Storages	▪ Would continue to dominate the segment till 2037-38
	▪ Need to focus on creating new efficient capacity as well as explore options for retrofitting existing capacity
		▪ Need to focus on Vapor compression technologies
		  ▪ Ammonia Systems (for cold storages)
		  ▪ HFC/HCFC based systems (others)
		▪ Technologies such as zero energy cooling chambers (ZECC), solar based cold storages are still nascent and evolving, potential to promote such technologies

Pack houses **Ripening chambers** **Reefers**	▪ Most of the capacity is expected to be created in next decade ▪ Accordingly, there is need focus on new capacity addition to avoid lock in of inefficient infrastructure	

Based on ICAP study

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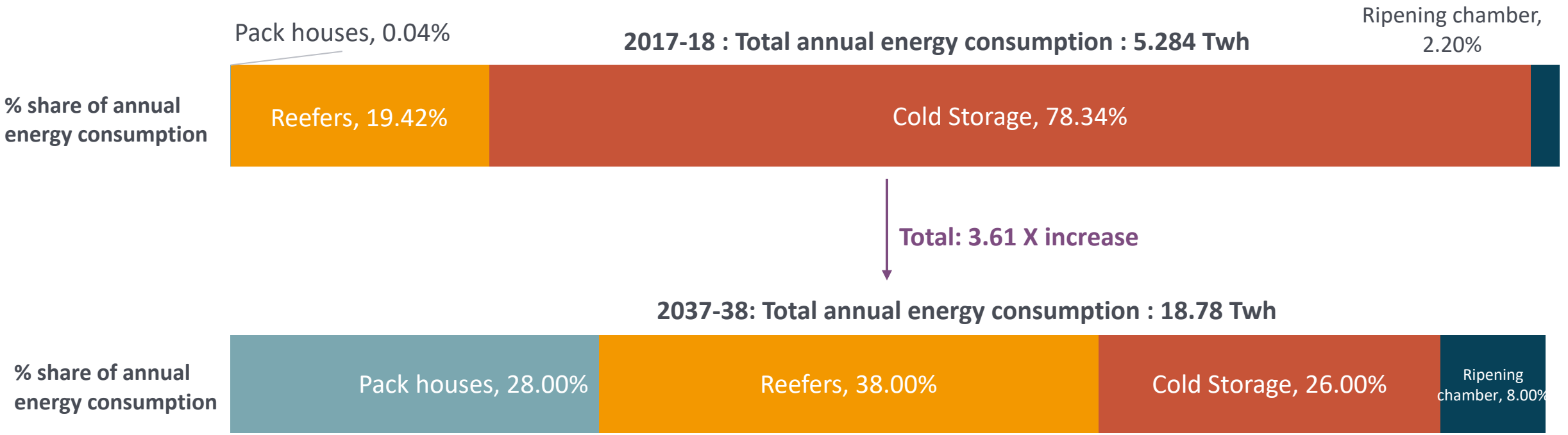
Cold Chain: Annual energy consumption, split by facility type (conservative scenario)



Takeaway	Need to prioritise policies across Cold Storages, Reefers and Pack-house segment

- All number sourced from ICAP study, except for reefers.
- For 2037-38, reefer stock of 100 K units has been taken for calculations, instead of 400K taken in ICAP study

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Policy options for Cold Chain Energy Efficiency

Insulation material

Guidelines

Star Labeling

Compressors

Envelope

Condensers

Expansion valves

Reefers

Condensers

Evaporators / Fans

Control systems

Ammonia Chillers

Walk in cold rooms

Energy Benchmarking

PAT program

Opportunities

- 30+ opportunties across technologies, equipment, system, envelope, materials etc.

Shortlisting principles

- Energy saving potential
- Market readiness, technology profile
- CLASP's expertise

Policy options

- Equipment / appliance specific policies
- Program that focusses on technology upgrades
- Guidelines for Operation and Maintenance (O&M), system design, equipment and material selection

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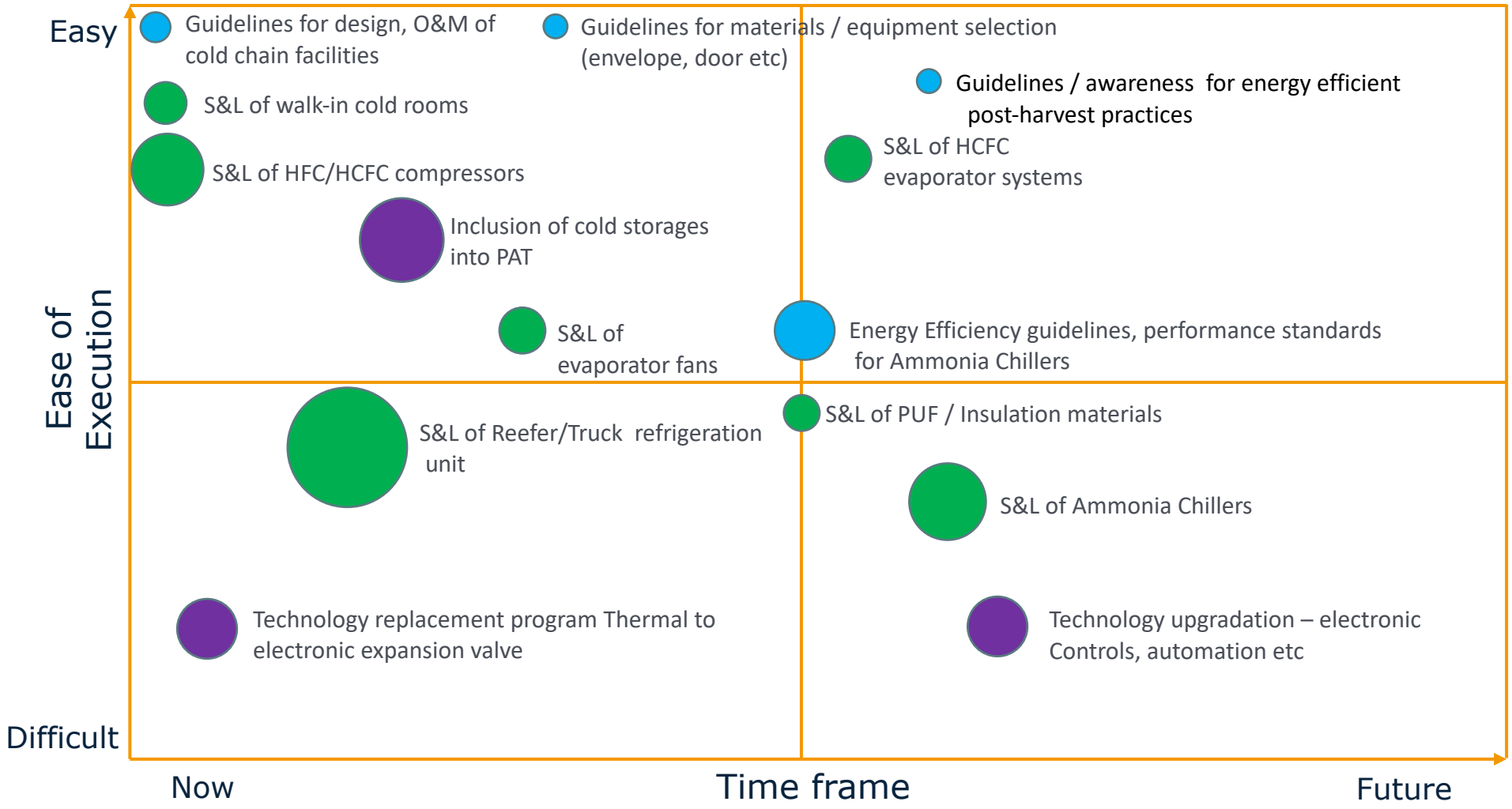
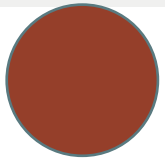
Prioritisation of Energy Efficiency Opportunities





Bubble of this size represents energy savings of 0.72 TWH

Standards and Labelling (S&L) related opportunity

Guideline related opportunity

Other policy options

Notes:

- Savings are based on 2037-2038 ICAP reference scenario
- Size of circle indicates relative energy saving potential
- For guidelines, a flat savings of 0.1 Twh has been assumed (except ammonia)
- Ease of execution is assessed on market readiness, technology profile, dependance on other govt. agencies etc

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#1: Energy Efficiency Labelling of refrigerant compressors used in Cold Chain applications

S	• India already has a well-developed S&L ecosystem • Bureau of Indian standard (BIS) has standards on refrigerant compressors
W	• Ongoing revision of ISO standards, Non-existent lab capacity s • Lack of consensus among stakeholders on efficiency indicators, high variability of refrigerants used
O	• Organized market, dominated by select OEMs • Global supply chains – potential for harmonization and replication elsewhere
T	• Program to be introduced as voluntary • Variation in use compressor use cases / ambient conditions may be difficult to normalize

Preliminary assessment has been encouraging

1

	Description	Value
1	Annual sales	~ 40,000
2	Annual growth	10% – 15%
3	Energy saving potential	~ 20%
4	Cumulative energy saving potential (2024 - 2030)	> 0.25 Twh

2 **Enabling set of BIS standards (IS 5111)**

3 **As per limited consultations, there is potential to adopt COP as energy efficiency indicator**

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#2: Energy Efficiency Labelling of Walk-in Cold Rooms (WICR)

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S	• India already has a well-developed S&L ecosystem • Bureau of Indian standard recently released for Walk – in Cold Rooms
W	• Limited lab capacity for testing • WICR are complex systems with multiple equipment / envelope components
O	• Rapid / exponential market growth due to formalization of Agri supply chains in India
T	• Market is dominated by unorganized players • There may be a need to build capacity of unorganized players – may be resource intensive

Preliminary assessment has been encouraging

1

	Description	Value
1	Installed stock (units)	~ 1,50,000
2	Annual sales	~ 23,000
3	Annual growth	10% – 15%
4	Baseline annual energy consumption (existing stock)	~3 TWh
5	Cumulative energy saving potential (2024 - 2030)	> 1.5 TWh

2 **BIS is already conducting stakeholder consultations to explore inclusion of energy efficiency parameter in the standard**

3 **Precedence of WICR labelling exists in other countries – best practices can be adopted**

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#3: Inclusion of Cold Storages under Perform Achieve and Trade (PAT) Program

S	• PAT program is operational, energy saving certificates are being traded • Provides opportunity to cold storages to undertake efficiency improvement at own pace
W	• Seasonality of operations, operating characteristics may vary by crop type stored • Baseline audit and target setting is time taking, followed by 3-year long performance cycle
O	• PAT targets may drive energy efficiency as well as adoption of renewable energy • Technology neutral approach, empowers owners to identify and implement EE measures
T	• Significant portion of the cold storages are unorganized, compliance may not be effective

Strong case for inclusion under PAT, feasibility study needs to be conducted

1

	Description	Created
1	Cold Storage capacity (TR)	5,21,705
2	Total number of cold storage (Nos)	7,901
3	Specific power consumption of compressor (estimated, KW/TR)	1.2
4	Total Electrical connected load (MW)	612
5	Annual energy consumption (TWh)	4.02

2 **Energy saving potential as per past studies: >10%**

3 **Cumulative energy saving potential (2024 - 2030): ~2 TWh**

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Key takeaways

Standards and Labelling (S&L) of cold chain components with high market growth

Why:

- To avoid lock–in of inefficient stock
- Can form the basis of Minimum Energy Performance Standards (MEPS) in future

What:

1. **Compressors:**
   - Used in almost every cold chain system
   - Highly organized market
   - Potential to harmonize polices across countries
2. **Walk-in Cold Rooms (WICR):**
   - Increasing adoption in India
   - Ongoing global efforts to label WICR

Energy saving targets for select large Cold Storage facilities

Why:

- There is a huge variation in cold storage technology type and vintage: technology neutral approach required to address the diversity
- Cost efficient energy saving measures may vary by type of technology, commodity stored

What: Inclusion of Cold Storages under PAT program

- Mandated entities can go for energy efficiency interventions as per respective marginal cost of efficiency improvement; or
- Simply buy certificates from the market

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Thank you!

Any questions?

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