



National Cooling Plan for Lebanon (NCPL)

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Elements of Lebanon's National Cooling Plan:

1

Objectives and implementation steps



2

Methodology

3

Market survey: identifying the number of ***appliances in use***

4

Emissions mitigation scenario

5

Policy options - *MEPS and labels* – *Test standards*

6

Assessment of *funding and financing scheme*

7

Integrating the NCP into Lebanon's NDC

Project objective: establishing a National Cooling Plan (NCP) for Lebanon.



Overview of the Lebanese RAC sector

- Data collection for RAC sectors & subsectors
- Assessment of the RAC sector energy consumption, emissions and savings potential
- Assessment of the regulatory framework
- Modelling of pathways / mitigation

MEPS & Labels

- Evaluation of current policies and standards,
- Developing MEPS & labels for AC and domestic refrigerators
- Assessment and recommendation on equipment testing procedures

Development of NCP

- Methodology
- Integration of RAC sector market assessment and MEPS & labels assessment
- Assessment of funding and financing mechanism for the market transformation
- Proposal for the inclusion of NCP into NDC
- Proposed roadmap for implementation

Training and Capacity Building

- For the manufacturing sector
- For the servicing sector
- Vocational School Teachers



The Lebanon NCP in the context of the commitments to the MP, Kigali Amendment and the Paris Agreement.

Montreal Protocol & Kigali Amendment



- ⑩ **HCFC phase out** 98.5% by 2030 and 100% by 2040,
- ⑩ **HFCs phase down** Article 5 parties, group 1:
 - ⑩ Baseline 2020-22
 - ⑩ Freeze consumption by 2024
 - ⑩ 1st Reduction step: 10% by 2029
 - ⑩ 2nd Reduction step: 30% by 2035
 - ⑩ 3rd Reduction step: 50% by 2040
 - ⑩ 4th Reduction step: 80% by 2045

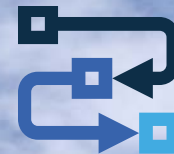
Paris Agreement

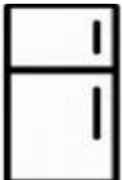


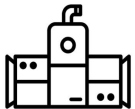


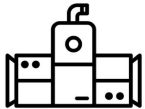


- ⑩ **Peaking of emissions as soon as possible & net zero** emissions by 2050 (Art 4),
- ⑩ **MORE AMBITIOUS** targets in NDC plans every 5 years,
- ⑩ Long-term (by 2050) **low greenhouse gas emission development strategies** published by 2020 (Art 4/19).

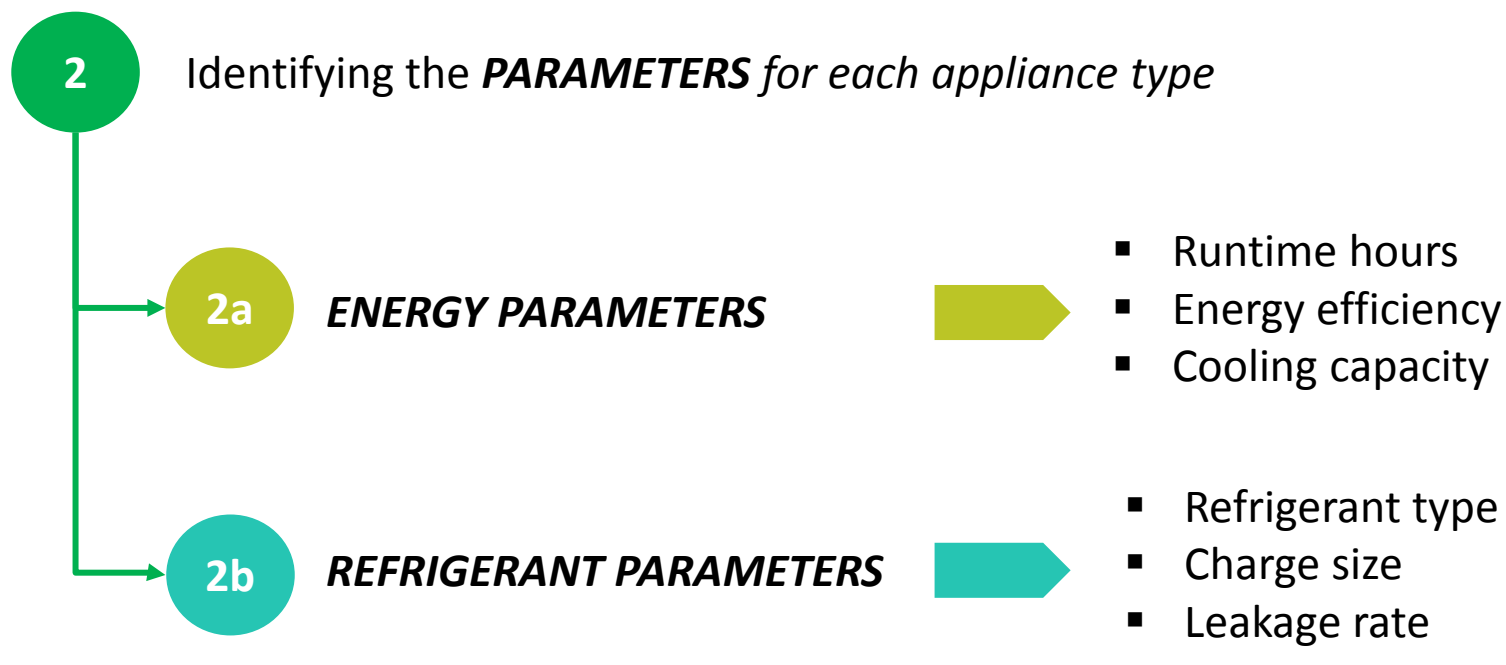
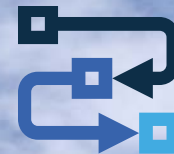
→ Lebanon agreed and committed to both convention

The RAC inventory covers all the relevant cooling activities.



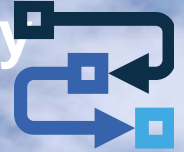
REFRIGERATION			AIR CONDITIONING		
Domestic			Unitary AC		
Commercial			Chiller		
Transport			Mobile AC		
Industrial					

Identifying the critical use parameters for each appliance type.

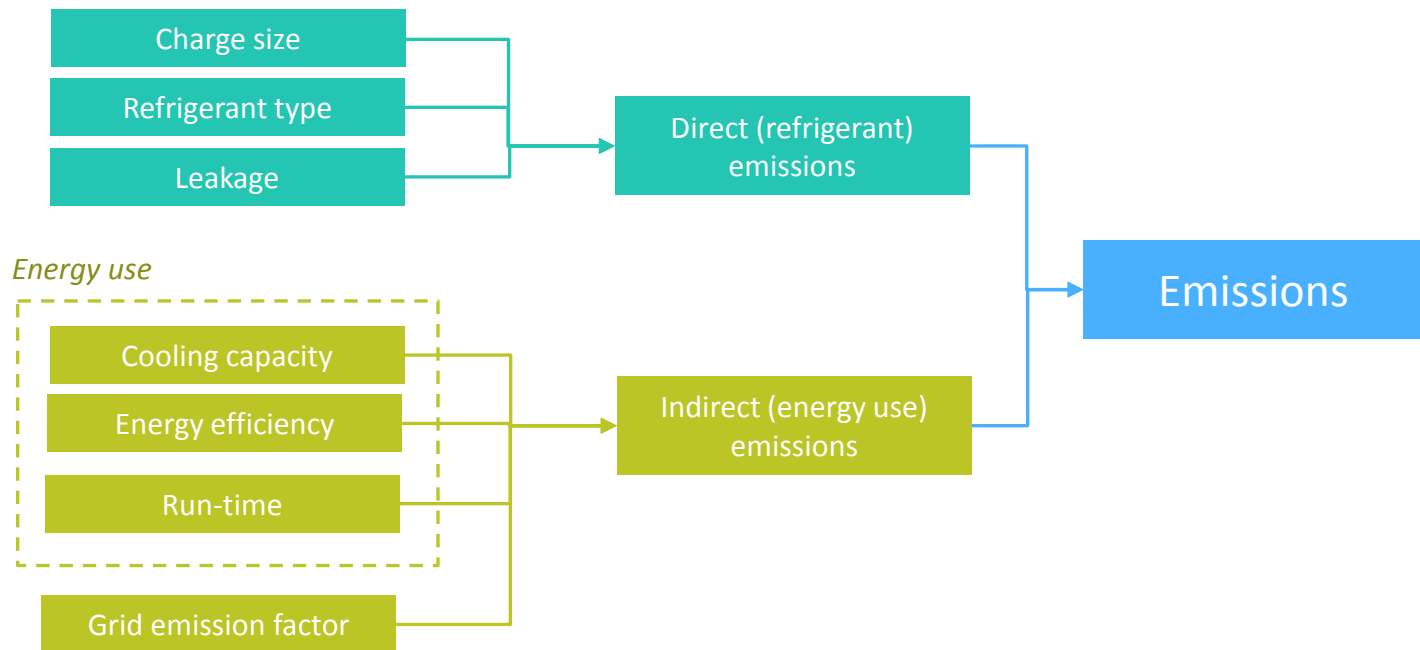


→ Use local data where available, otherwise applying international default data

Emissions from the RAC Sector were estimated by adding energy and refrigerant emissions.



- DIRECT EMISSIONS from refrigerants leaking to the atmosphere.
- INDIRECT EMISSIONS from the energy consumed by each appliance type.



Primary data questionnaires were sent to distributors and manufacturers.



Company data

Unitary air conditioning

	Company Name
	City
	Contact Person
	Contact Details
	Date
	Notes

Sales data

Appliance data

For each appliance type

	Average parameters per capacity range
	Average EER [kW/kW]
	Initial Charge [kg/unit]
	Refrigerant used
	HCFC-22
	HFC-32
	HFC-134a
	HFC-407C
	HFC-410A
	HC-290 / HC-1270
	Other: please specify
	average unit price
	brands

Residential split (ductless) room air conditioners

Residential split (ductless) room air conditioners	Domestic sales
	2009
	2010
	2011
	2012
	2013
	2014
	2015
	2016
	2017
	2018
	Capacity shares
	Small capacity (<= 3 kW)
	Medium capacity (>3 kW, <=5 kW)
	Large capacity (> 5 kW)

Sample unitary AC data asked from distributors and manufacturers

Objectives of the RAC Sector inventory assessment:

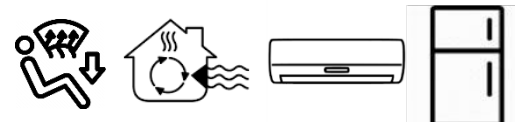









- Determining the **number of RAC appliances** used in each RAC subsector,
- Analysing historical **sales trends** of appliances,
- Modelling future appliance **sales and stock projections**,
- Modelling historical and future **energy use and GHG emissions**,
- Identifying the **mitigation potential** through the deployment of energy efficient appliances and the use of low GWP refrigerants.

Understanding the stock of RAC appliances currently in use in Lebanon requires data from



Determining the number of **APPLIANCES IN USE**



REFRIGERATION		AIR CONDITIONING	
Domestic		Unitary AC	
Commercial		Chiller	
Transport		Mobile AC	
Industrial			



For each subsector, appliance use data was collected from available sources:

- **Primary data: Questionnaires** from manufacturers and distributors.
- **Secondary data: Customs, studies** (such as those related to HPMP), surveys.

Projections built on thorough market survey.

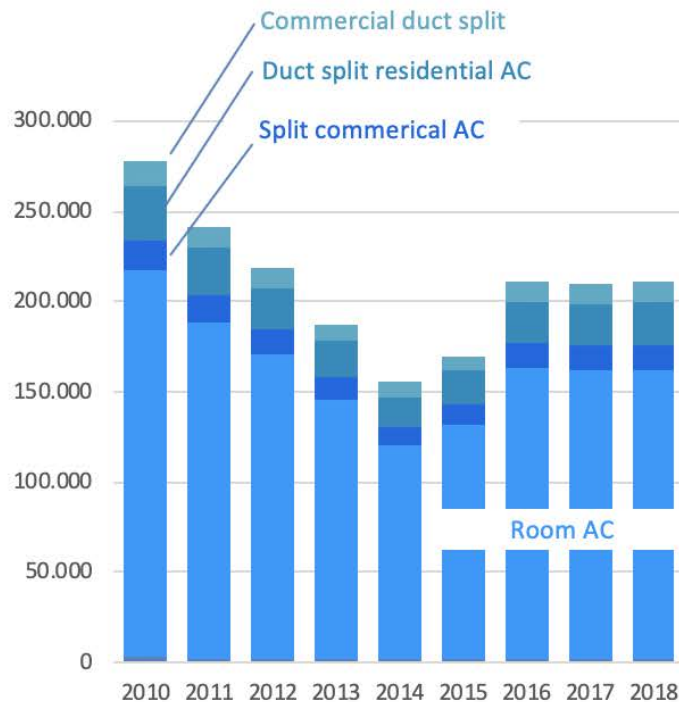


- Field visits to major sales points and extensive inventory reviews:
 - More than **25 shops** across Lebanon were visited,
 - The survey covered **79 different refrigerators' model and 44 AC models** – via internet research the EE of the appliances were identified.
- **Distributor and manufacturer survey** covering **45% of the market.**
- Supplementary data from:
 - Statistical data such as imports and export,
 - IPCC default values,
 - Expert opinions,
 - Previous survey reviews.

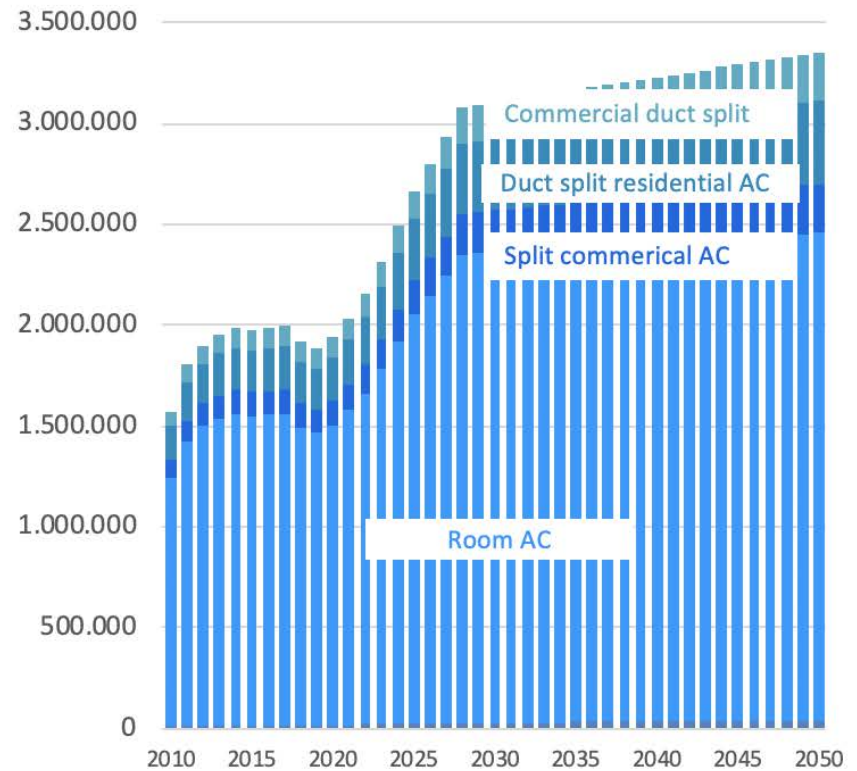
UAC stock increases as income and demand for cooling increase.



AC sales



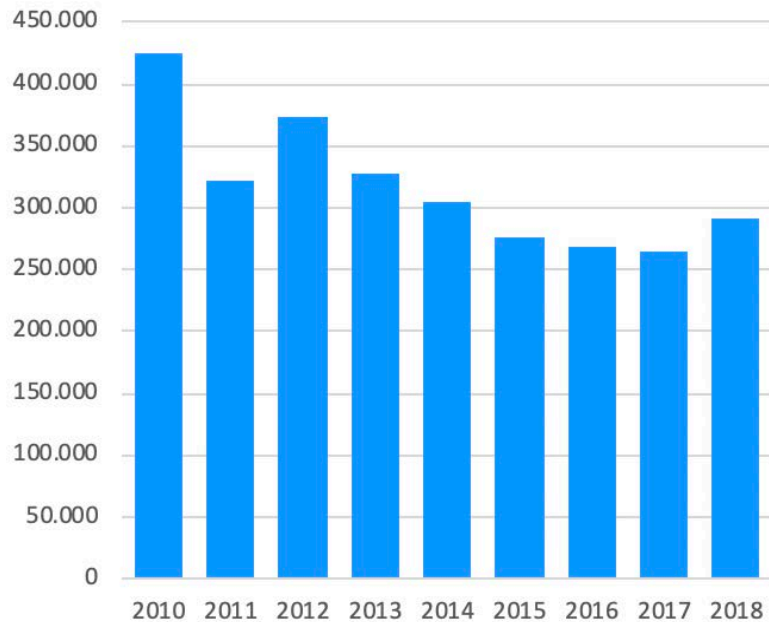
AC stock



Domestic refrigerator sales have been slow in the last few years.

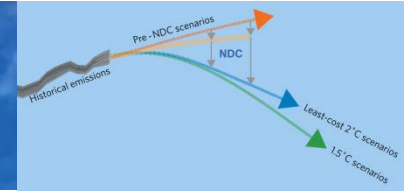


Refrigerator sales



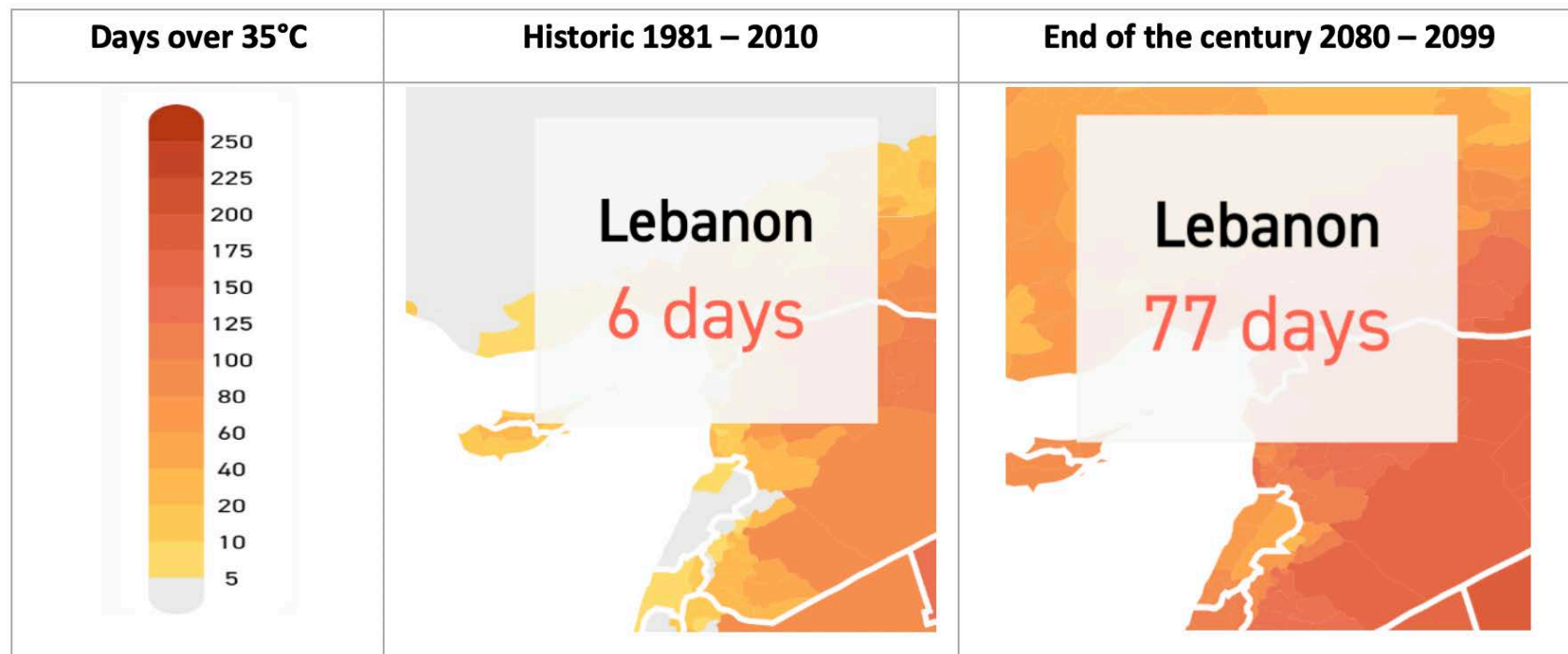
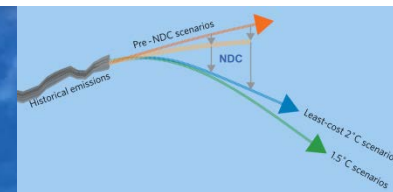
- High level of domestic refrigerator ownership saturation,
- Economic growth won't affect sales strongly,
- Population trends will be the major influence for stock levels.

Cooling demand drivers:



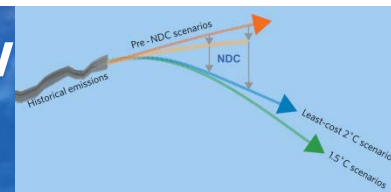
- **Population growth** - influences the total **number of households** as well number of people per household, affecting cooling demand.
- **Rates of urbanisation** – Urban households usually have a higher probability of owning an AC or refrigeration unit, as well as making greater use of these appliances.
- **Climate change** – As climate change takes hold, it is likely to increase temperatures in the region causing increased demand for cooling.
- **Economic growth** – Increased economic growth will drive demand in the RAC sector as there is increased activity in the economy. Similarly, increasingly wealthy households will make greater use of AC usually expressed in more or larger units working for a longer time.

Cooling demand driver: Increasing temperatures

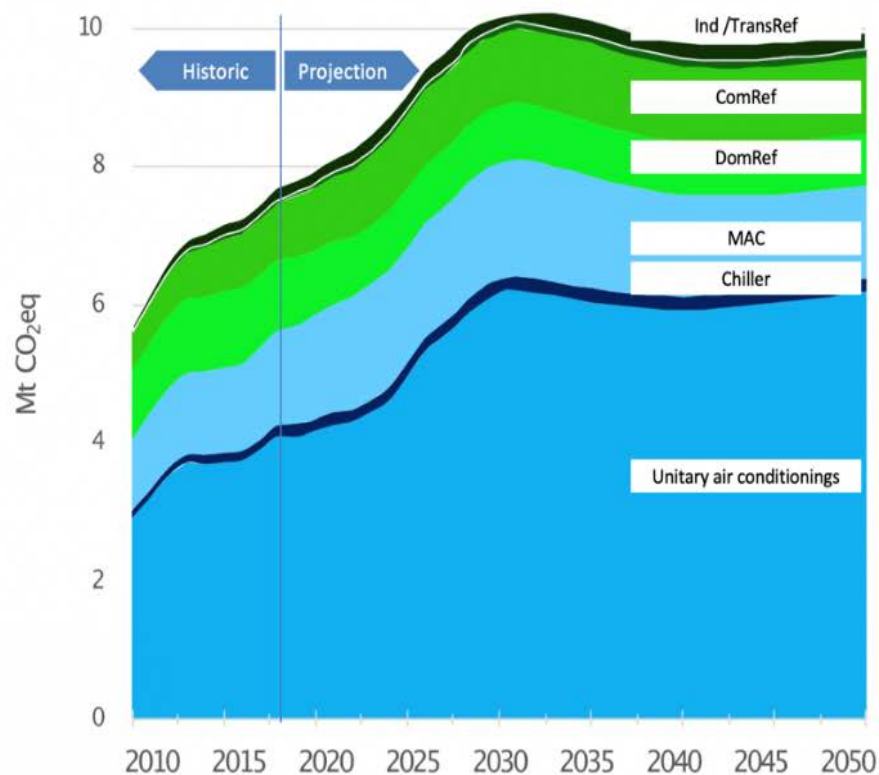


Expected temperature change from climate change (days >35°C) Source: Climate Impact Lab

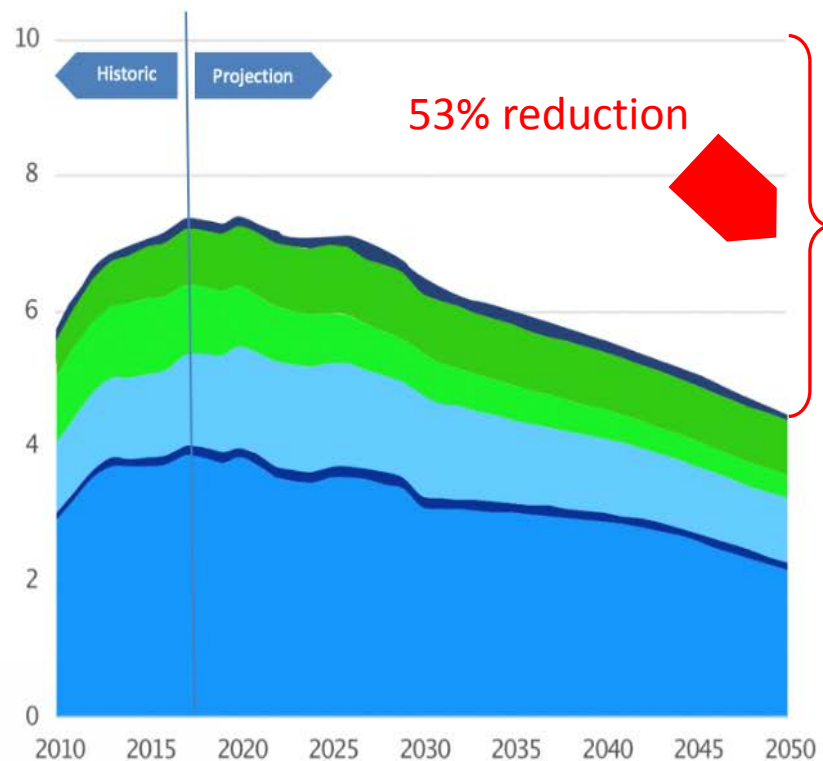
Under the NCP GHG emissions are 53% lower than BAU in 2050.



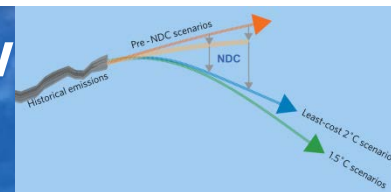
BAU RAC GHG Emissions (MtCO₂eq)



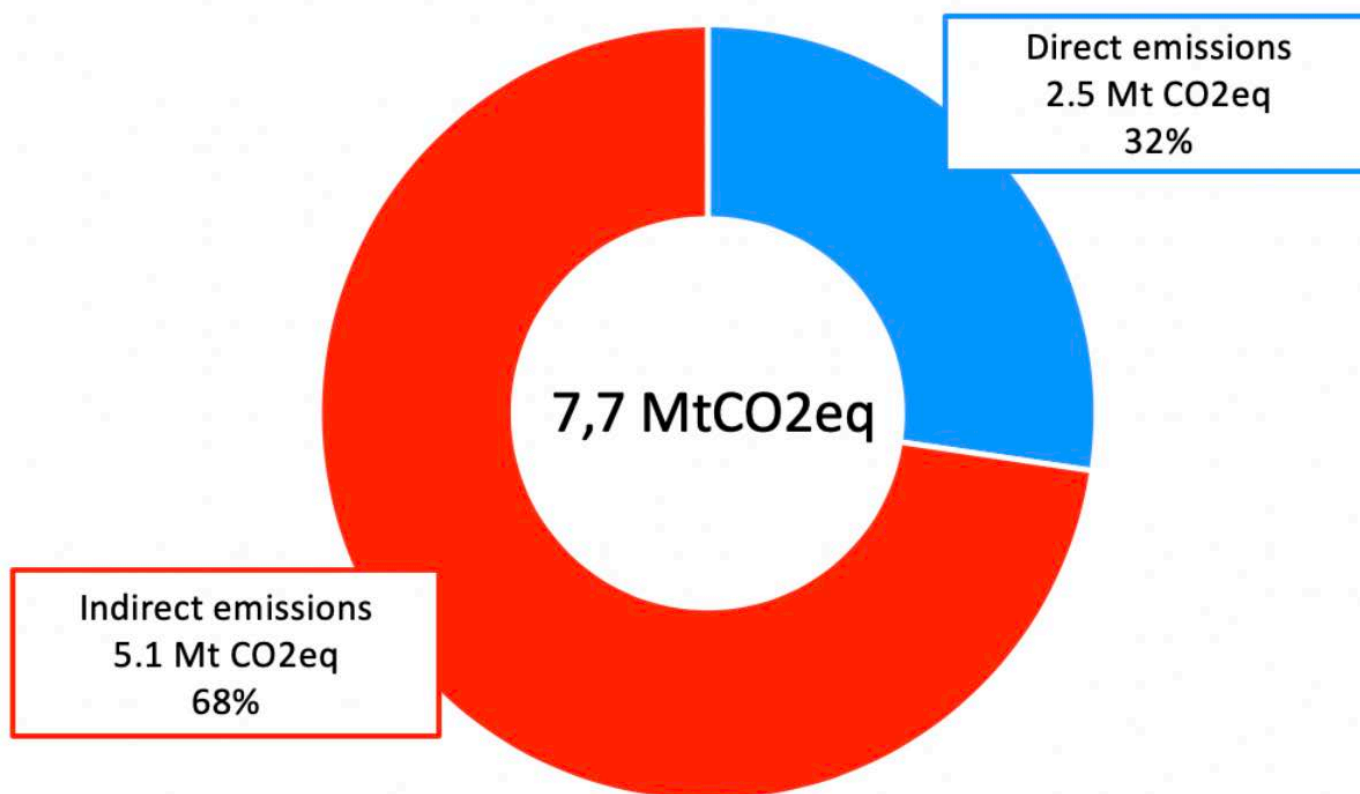
Mitigation RAC GHG Emissions (MtCO₂eq)



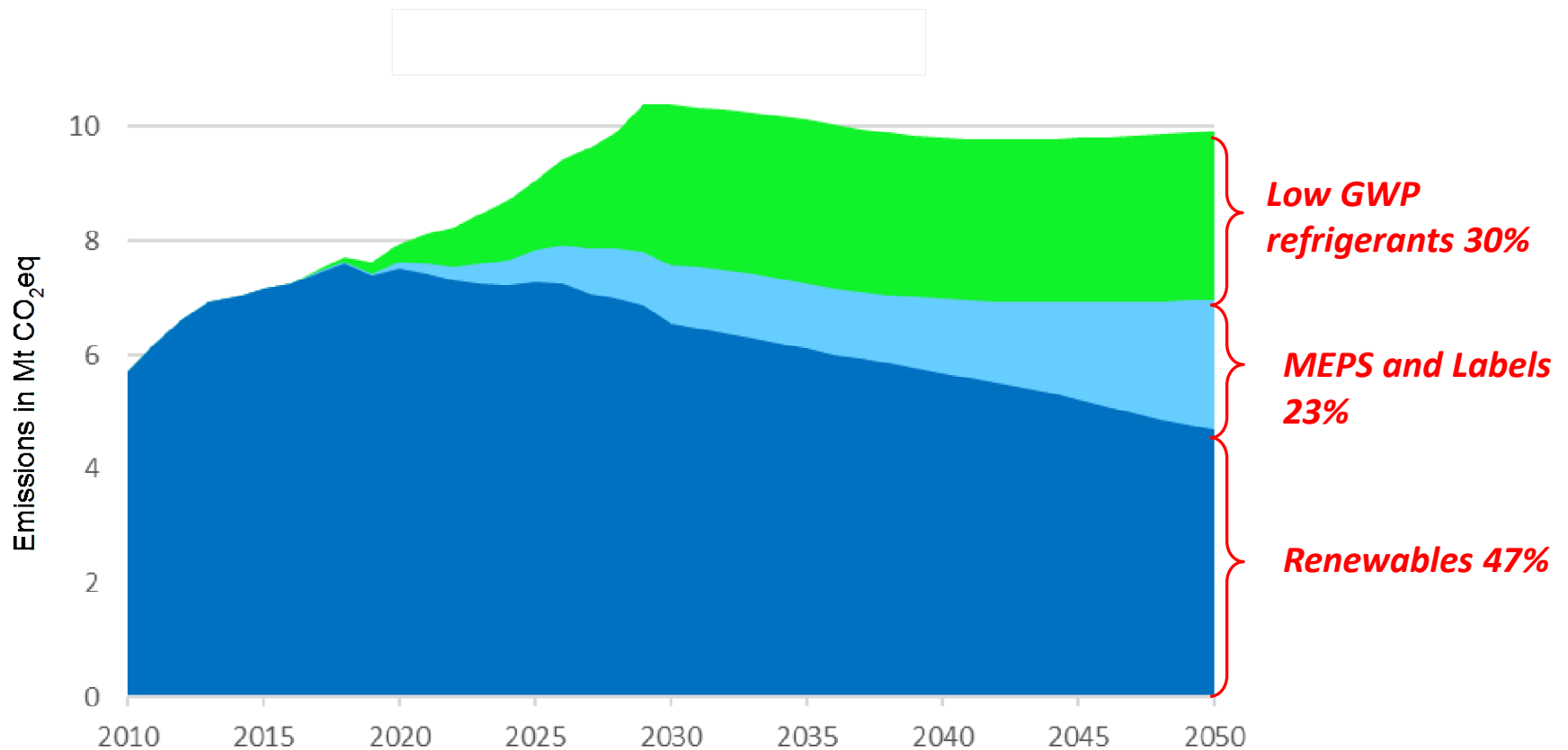
Under the NCP GHG emissions are 53% lower than BAU in 2050.



Split of direct and indirect emissions

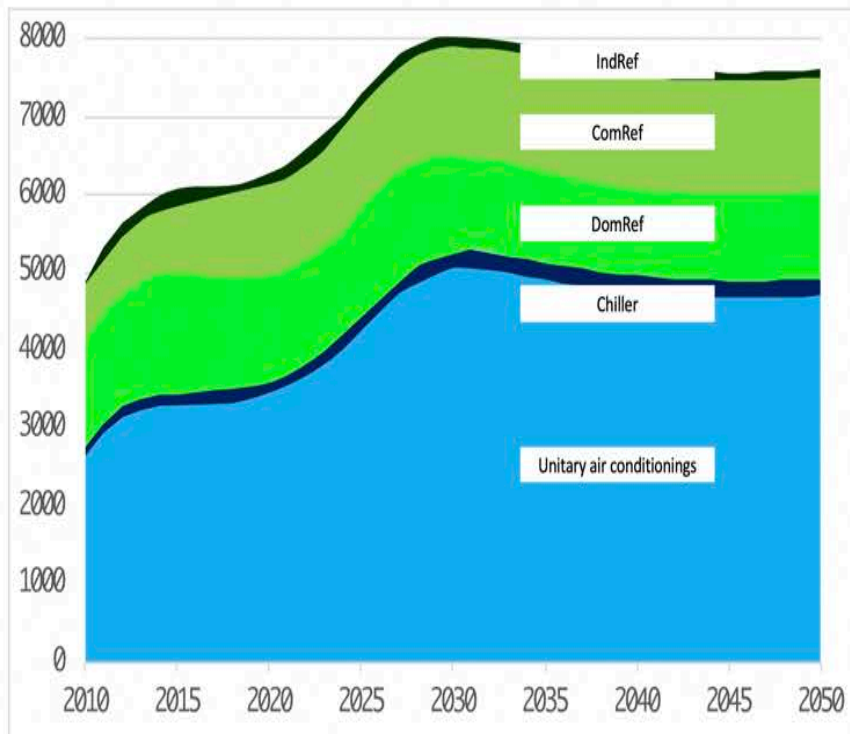


Impact of energy efficiency and low GWP refrigerants

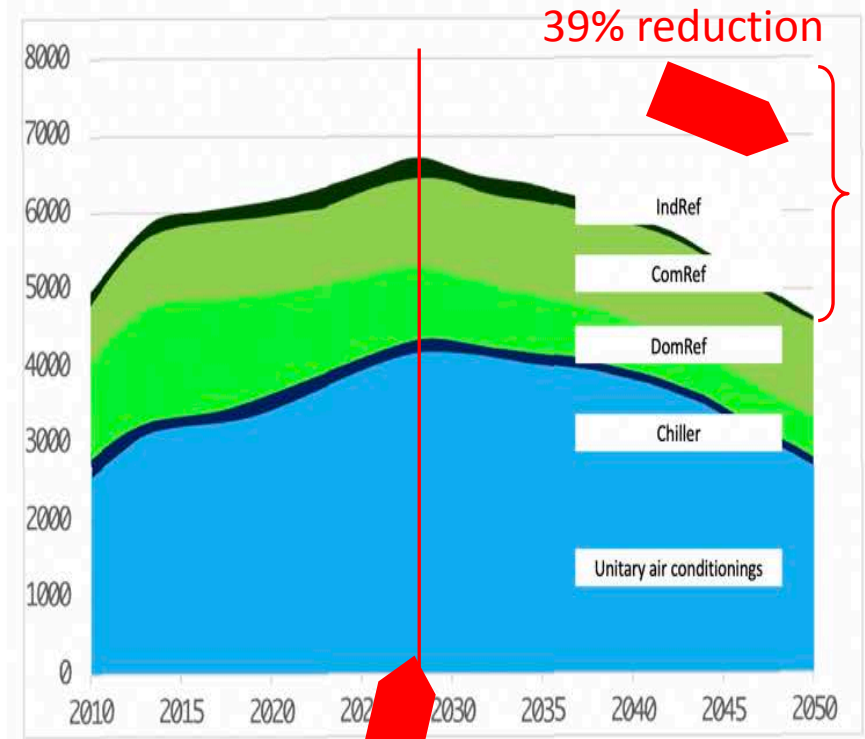


Electricity demand in the Mitigation scenario is 20% lower in 2050 vs 2018, and 39% lower than 2050 in BAU

BAU RAC Electricity demand (GWh)



Mitigation RAC Electricity demand (GWh)



Energy demand peaks 15% below BAU, reducing pressure on Lebanon's electrical grid.

An integrated policy approach is needed for success



**Minimum Energy
Performance
Standards and
labelling**

Supporting policies

**Monitoring,
Verification and
Enforcement (MVE)**

Development standards for energy efficiency and low GWP refrigerants (safety standards).



**VOLUNTARY
STANDARDS**

**MANDATORY
STANDARDS**

Equipment type	Refrigerant safety standards	EE testing standards
AC	IEC 60335-2-.40	ISO 16358:2013
Refrigerators	IEC 60335-2-24	IEC 62552:2015

MEPS and Labels, implementation process: Voluntary Standards (EE and refrigerant standards)



Work Program on **Voluntary Standard**
- approved by LIBNOR Board of Directors BOD

New Technical Committee (TC) or
building on existing TC

TC develops Draft National Standard (DNS)

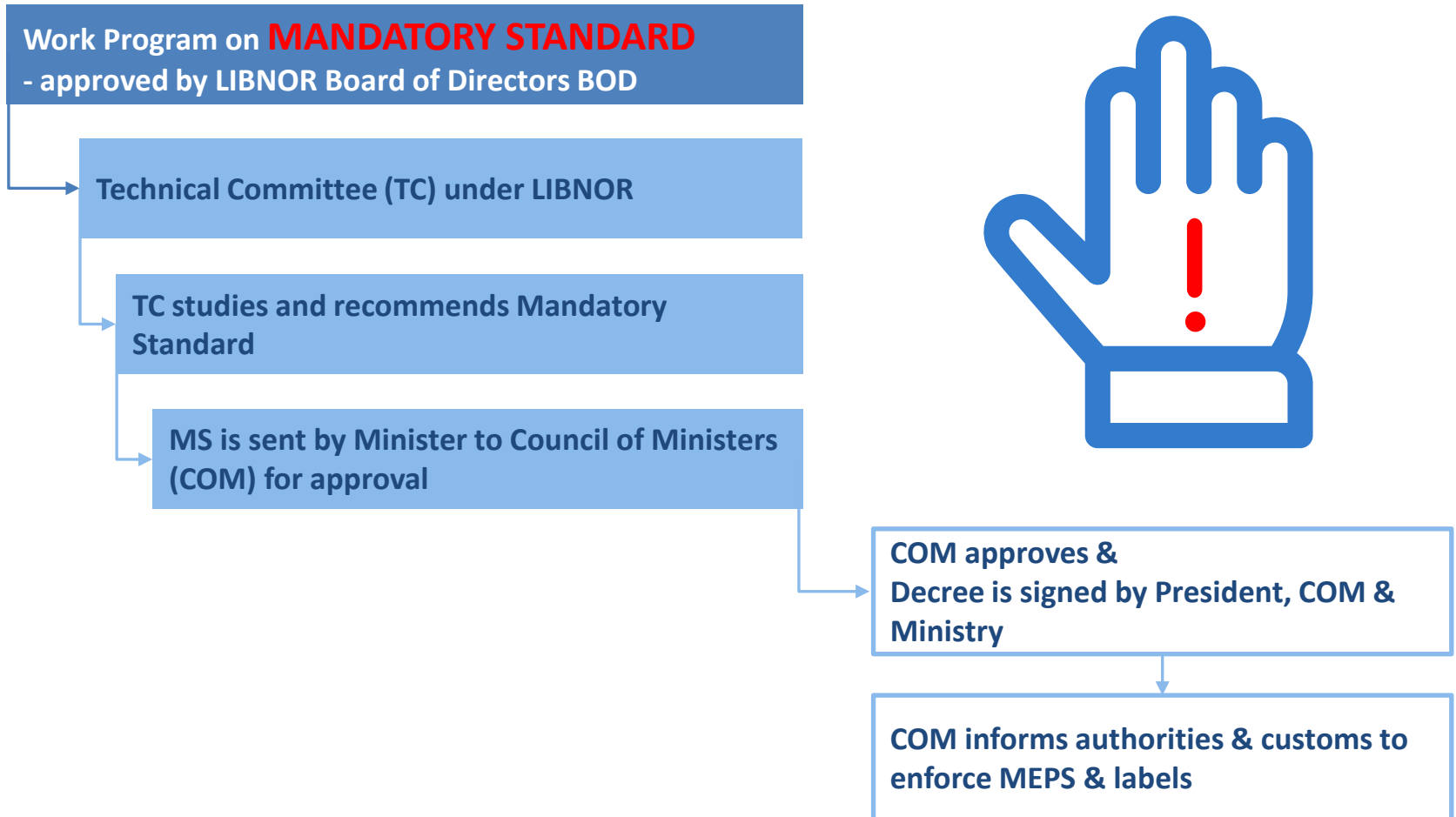
DNS goes on a 2-month trial period

Final DNS (FDNS) is submitted to BOD for
approval

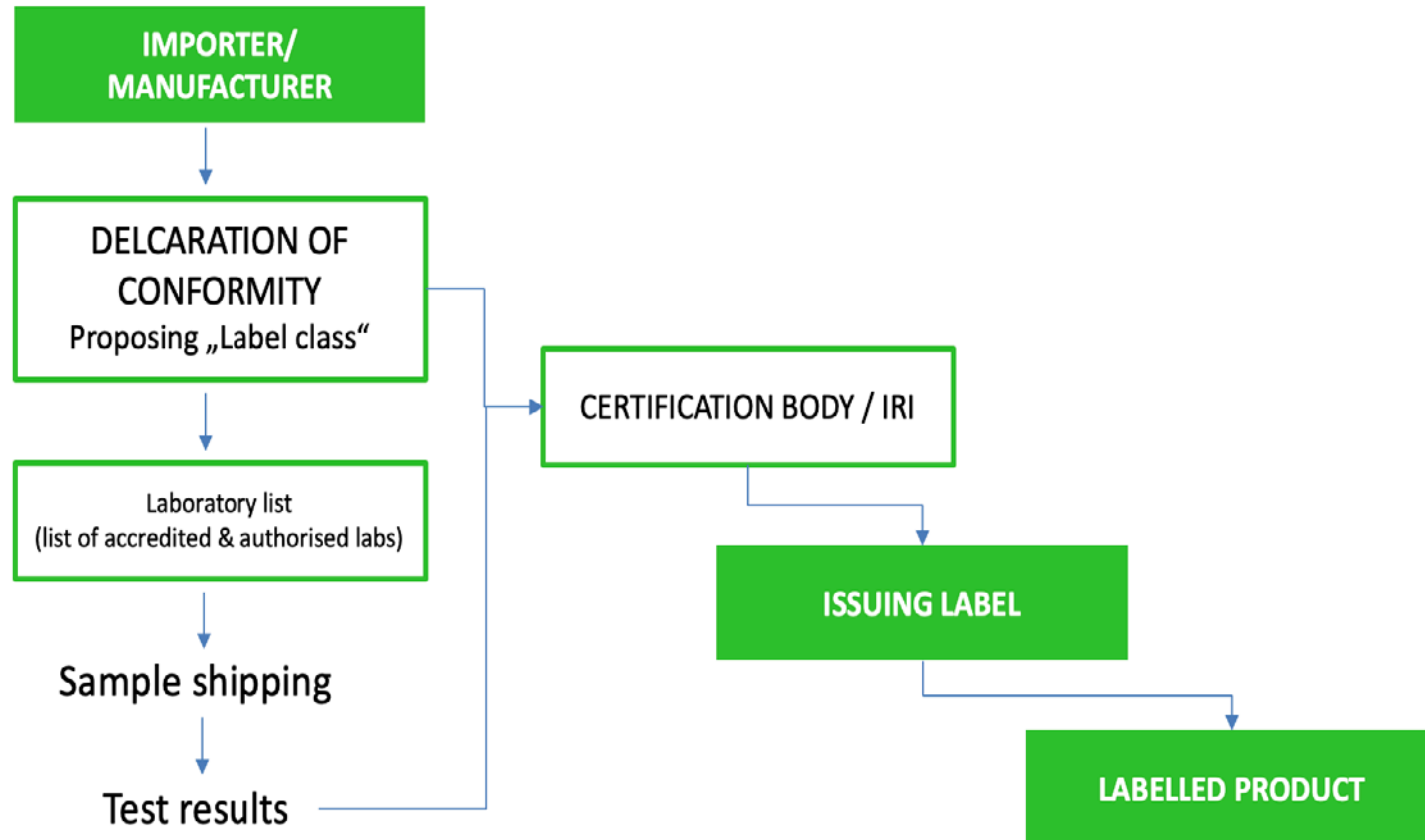
Approved FDNS is published in
Official Gazette



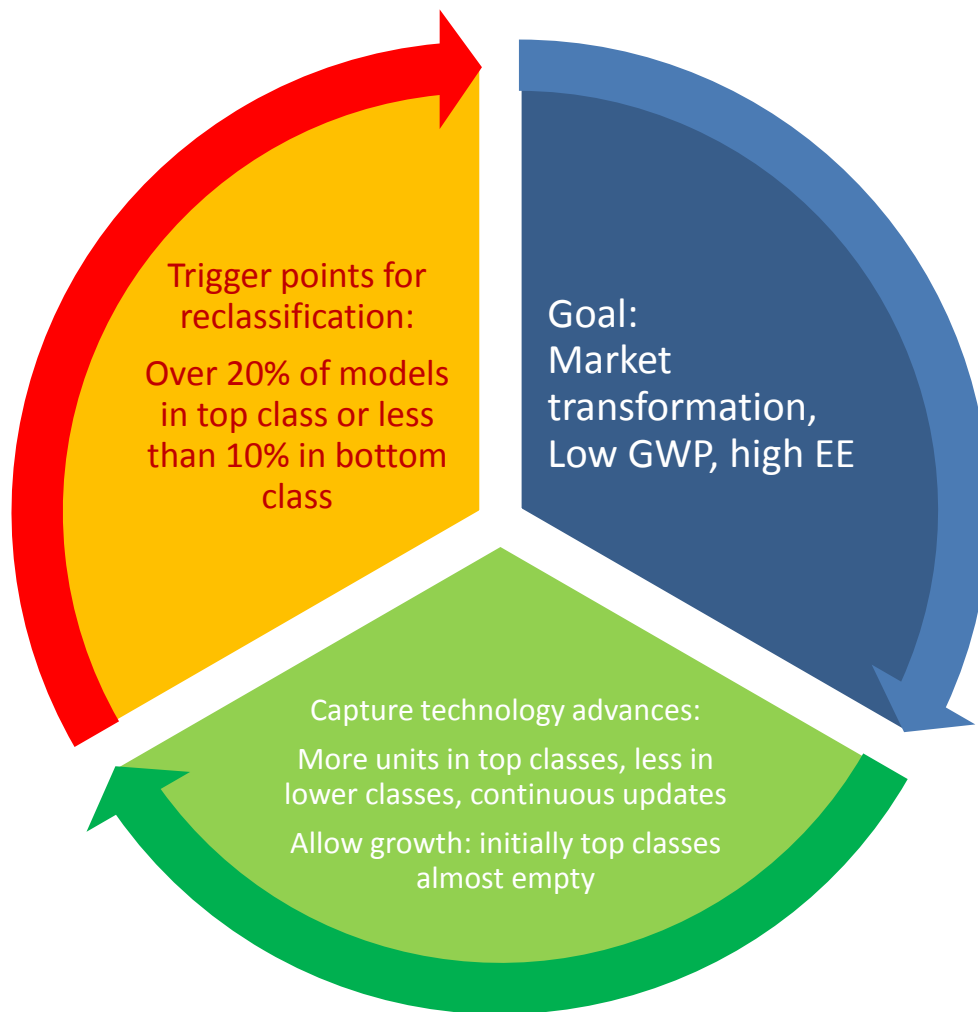
MEPS and Labels, implementation process: Mandatory Standards (EE and refrigerant



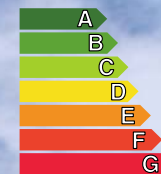
Mandatory standards: Only appliances meeting MEPS and labels standards are allowed for import



Recommended features of the MEPS and label program under the NCP.



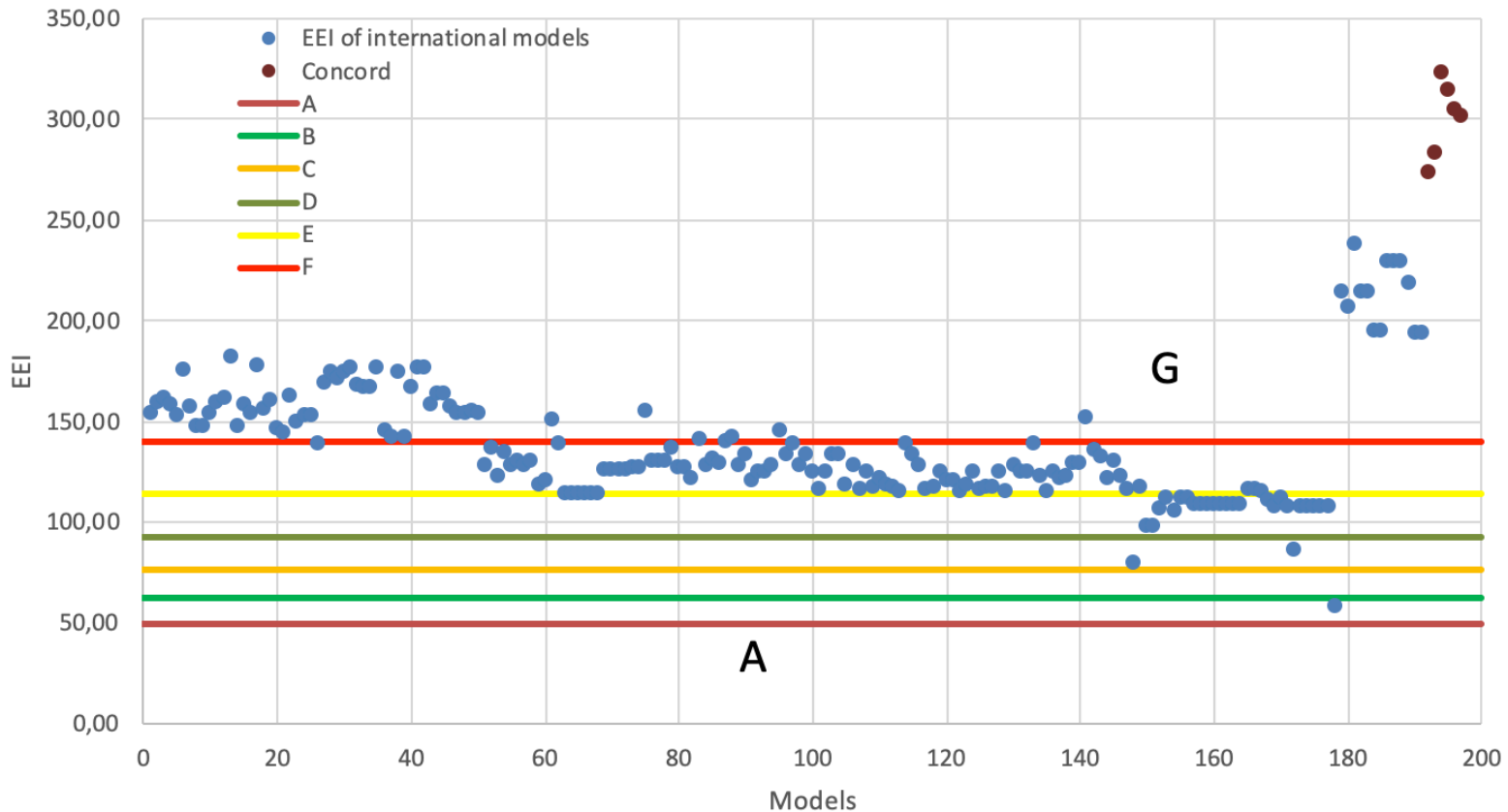
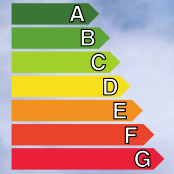
Proposed MEPS for domestic refrigerators.



	Label classes	Energy Efficiency Index - (EEI)	Number of surveyed models	% of surveyed models in each class
	1A	50	0	0%
	2B	62	1	1%
	3C	76	0	0%
	4D	93	2	1%
	5E	114	24	12%
	6F	140	91	46%
MEPS	7G	/	79	40%

- Starting with a relatively low MEPS (significantly below current and more future EU levels),
- Allow industry to adjust. Particularly local manufacturers,
- Still, MEPS eliminate 40% of the current models.

MEPS and labels designed to allow the market to grow



Only one model falls in the B category, two models in C, and the rest well below. Lebanon has a huge opportunity to gain.

Proposed MEPS for ACs: another big energy saving opportunity.



Energy class	SEER ranges	Average SEER	Avg. cooling capacity (kW)	Unit annual energy consumption (KWh)	Total models analysed
A	SEER>8.5	-	-	-	-
B	6.1 <= SEER < 8.5	6.29	4.86	793	26
C	5.6 <= SEER < 6.1	-	-	-	-
D	5.1 <= SEER < 5.6	-	-	-	-
E	4.6 <= SEER < 5.1	4.80	5.28	1,319	1
F	4.1 <= SEER < 4.6	4.14	3.52	1,019	6
G	3.6 <= SEER < 4.1	3.79	3.94	1,253	59
H (MEPS)	SEER < 3.6	3.23	4.22	1,568	44

MEPS takes the lowest performing appliances off the market and rebalances it at a higher level: 32% of the AC models will be banned and 43% will be in the lowest classes.

The funding and incentive system aims for a rapid and sustainable transition.



- Providing **incentives** for the introduction of a MEPS and label system,
- Sustainably funding the transition:
 - Accelerating the **take-back** of old, inefficient appliances,
 - Support the **market introduction** of more efficient appliances,
 - Having an environmentally sound **recycling** of old appliances.
- Use of **international climate finance** to kick-start the process (including contingent international funding),
- Develop sustainable **national funding** streams.

Sources and use of funds to finance the transition to energy efficient and climate friendly appliances.

SOURCES OF FUNDS

TAXING IMPORT OF ENERGY INEFFICIENT APPLIANCES

- Import duties related to the energy label class of appliances

TAXING THE IMPORT OF HIGH GWP HFCs

- Carbon tax on imported HFC refrigerants based on their GWP

CARBON CREDITS FOR THE DESTRUCTION OF HFCs IN OLD APPLIANCES

- Establishing a take-back system for old cooling appliances with the environmental sound recycling for of the appliances and the destruction of refrigerants. The GWP equivalent of the destructed refrigerants are sold as carbon credits. The system is to be established under a bilateral scheme e.g. with Switzerland (in future under Art. 6 of the Paris Agreement)

USE OF FUNDS

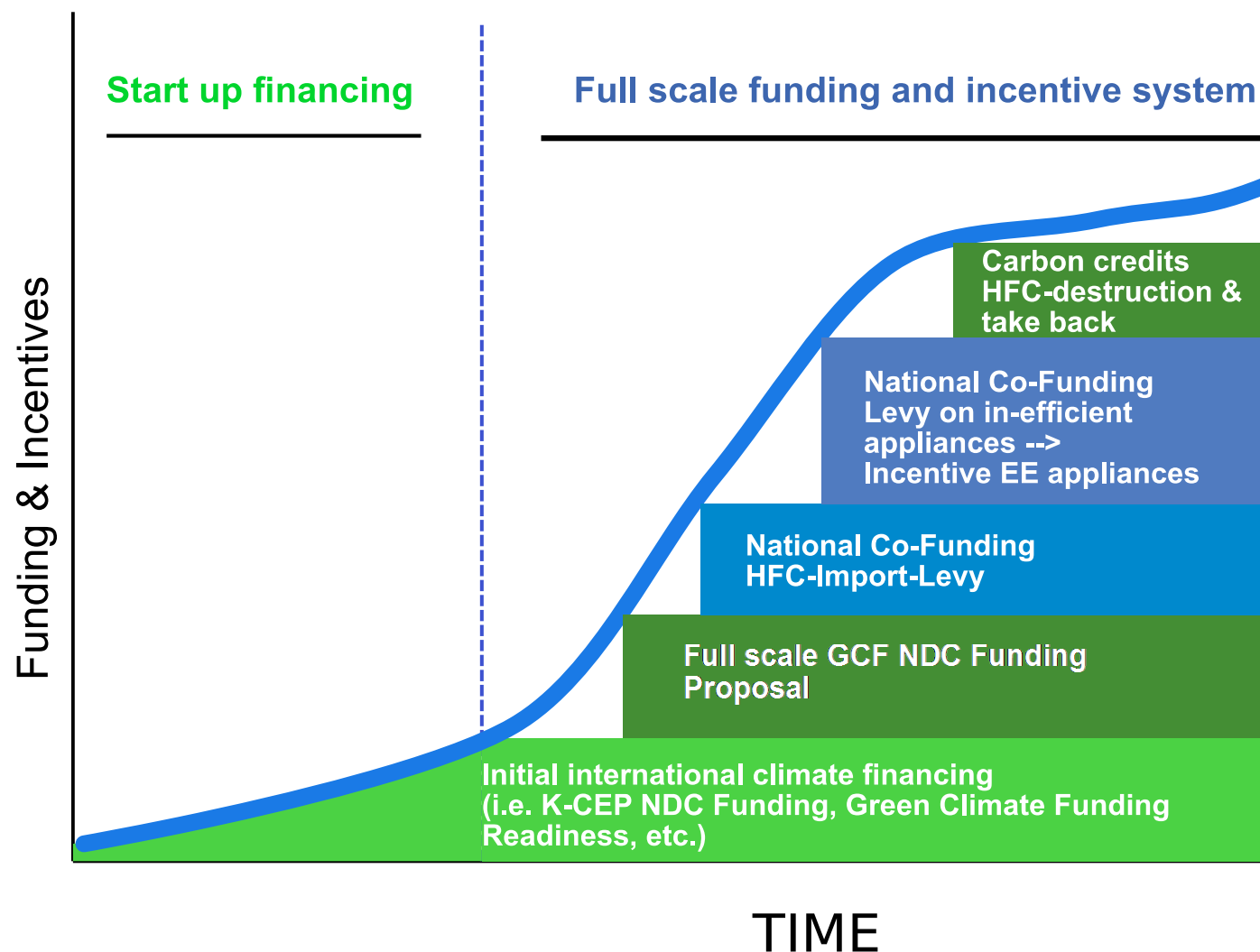
ACCELERATING THE MARKET INTRODUCTION OF ENERGY EFFICIENT APPLIANCES

- The required budget to establish an effective MEPS and label system,
- The installation of the relevant testing labs,
- The costs of certification tests and registration process,
- The market surveillance system including an effective fining system for non-compliance,
- In addition, the funding mechanism will provide financial resources in support for the local manufacturer transiting to highly EE appliances

EXCHANGE AND ENVIRONMENTALLY SOUND RECYCLING OF OLD APPLIANCES

- Establishing a take-back and exchange system
- Establish a central recycling centre for the environmental sound recycling of cooling appliances and the destruction of refrigerants

Implementation steps for funding and incentive system



Integrating the NCP into NDCs to deliver on energy saving and climate action.



- **Cooling has a significant share of Lebanon's carbon footprint.**
- **Through the implementation of the NCP a significant proportion of Lebanon's contingent NDC GHG savings can be achieved.**
- **The integration of the NCP will into the NDC will allow Lebanon to trigger additional international climate finance and promote an integrated and coordinated policy approach.**
- **The combination of low GWP refrigerants, high mandatory energy efficiency standards and renewable energy will lead to zero carbon cooling.**

Recommended roadmap milestones for the NCP implementation.



Current Status	2030		2025	2050
No MEPS and Labels	Import levies continued		Import levies – energy, GWP	Import levies continued
No incentives	MEPS & Labels – Com Ref, Com AC		MEPS & Labels –AC, Dom Ref	MEPS & Labels – Increase ambition
No building standards	MEPS Updating and extension		Building standards <150kWh/m ²	Building standards <50kWh/m ²
No/limited F-gas restrictions	Building standards <100kWh/m ²		Manufacture incentives	F-gas, HFC phase out
No capacity requirements	55% of MAC with low GWP		Technician registration	75% of MAC with low GWP
Recycling – F-gas, units	80% Recycling of units and gas disposal		Recycling – used units and gas disposal	90% Recycling of units and gas disposal

Final remarks:

The NCP is the overarching approach covering regulatory, technical, environmental and operational matters. It's an important step for Lebanon to contribute towards the targets of the Paris Agreement and the Kigali Amendment of the Montreal Protocol.

- RAC appliances having a ***significant share of Lebanon's electricity consumption*** and carbon footprint,
- Household appliances, ***refrigerators and ACs, with the largest impact,***
- ***Mandatory MEPS and labels*** as a *powerful instrument to lower electricity consumption and to achieve cost savings for the economy and end users,*
- A ***well-designed financial mechanisms*** can fund the transition provide and provide incentives to accelerate moving to higher efficient appliances,
- ***Inclusion of the NCP in Lebanon's NDCs*** as contingent step to trigger additional climate financing and securing the long-term path to near zero-carbon cooling.

**Lebanon has the tools, We
will soon take the next
step!**