

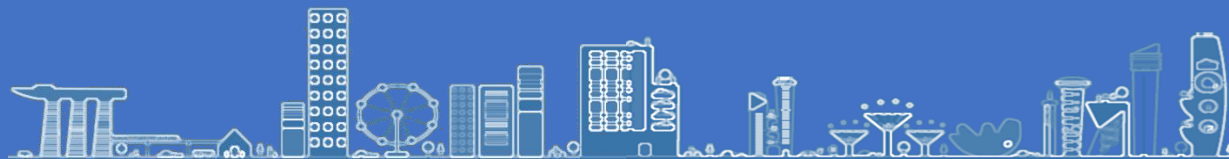
SINGAPORE'S FSV PRESENTATION

4 May 2018



OUTLINE

- 1 National Circumstances
- 2 Emissions Profile
- 3 2020 Pledge and Mitigation Measures
- 4 Experiences and Lessons Learnt
- 5 Written Questions and Responses



NATIONAL CIRCUMSTANCES



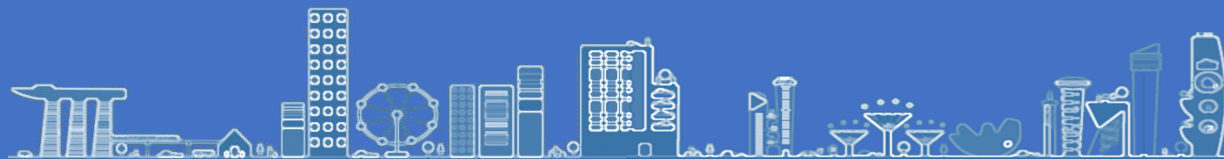
Dense Urban Landscape

- Small, low-lying, island city-state of around 720 km²
- Accommodate housing, commercial centres, air/sea ports, etc.
- Highly urbanised
- High population density of 7,650 per km²



Limited Alternate Energy Options

- Limited land area
- Low wind speeds
- Low tidal range
- Lack geothermal resources
- No large river systems for hydropower



NATIONAL CIRCUMSTANCES

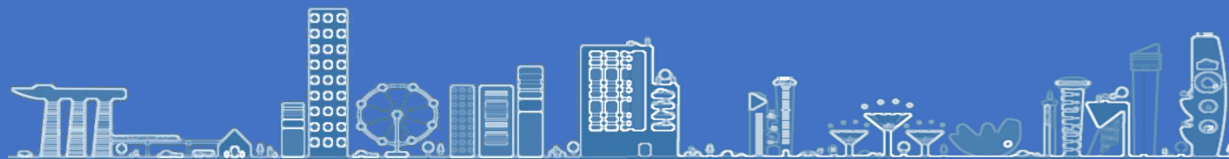
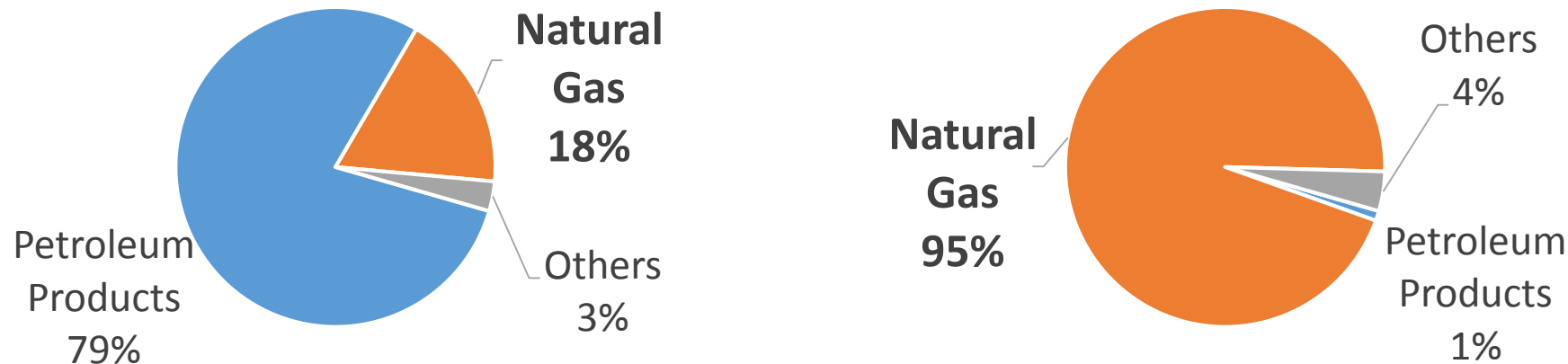
Economic Structure

- Lack of natural resources and hinterland
- Export-oriented economic strategy with manufacturing sector as one of our twin engines of growth

Fuel Mix

- Relies heavily on imported fossil fuels
- Undertook early actions to switch from fuel oil to mostly natural gas, the cleanest fossil fuel
- No fossil fuel subsidies

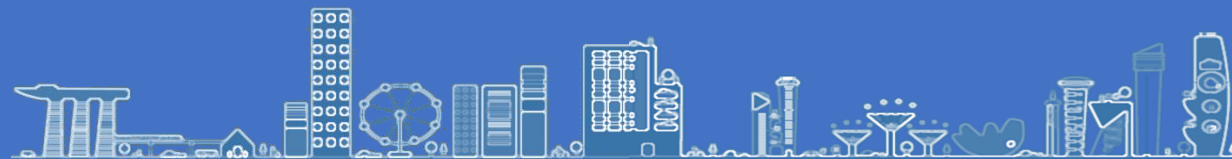
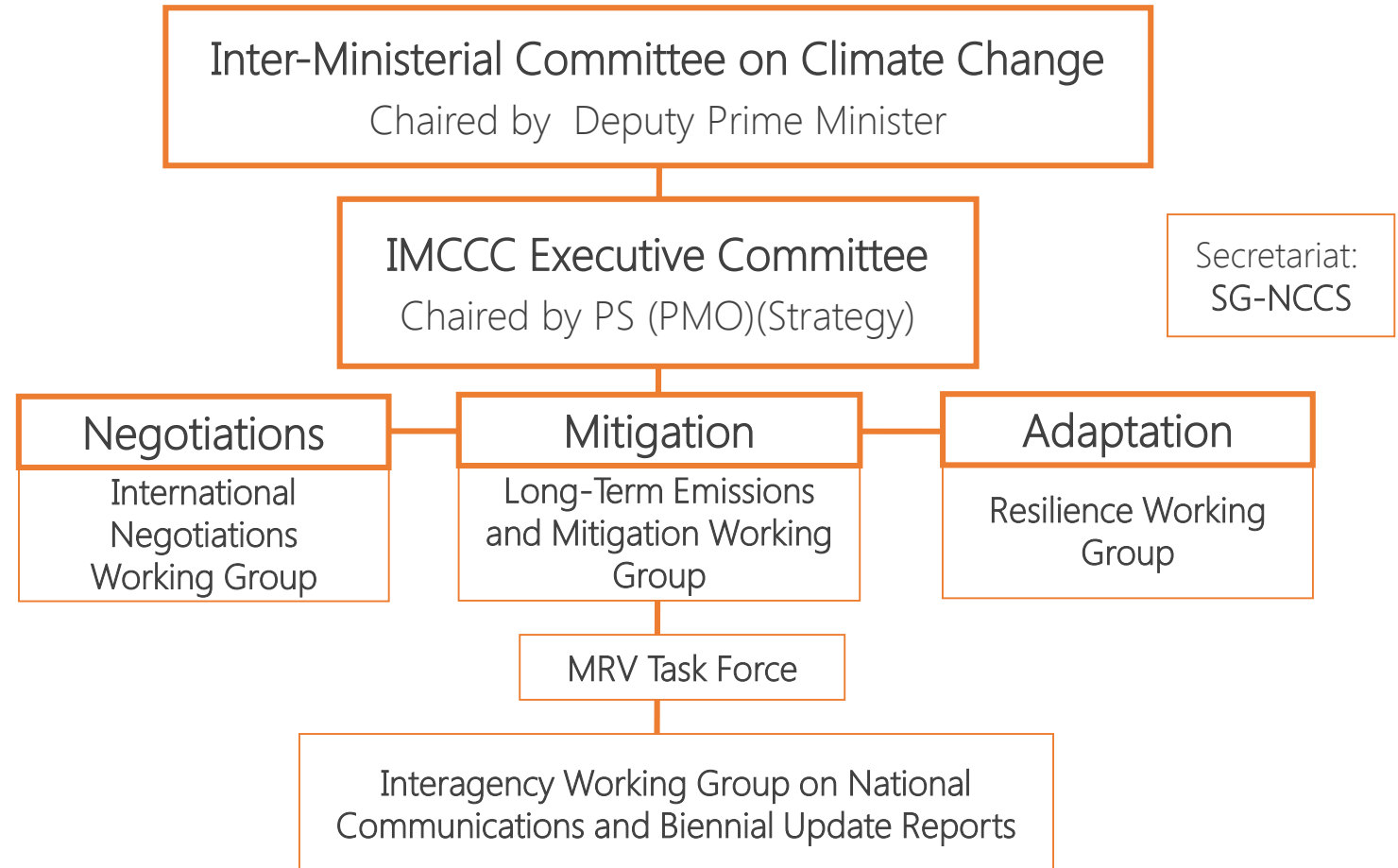
Singapore's fuel mix for electricity generation
(2000 vs. 2016)



INSTITUTIONAL ARRANGEMENTS

Agencies:

National Climate Change Secretariat,
Strategy Group
(SG-NCCS)
Ministry of the Environment
and Water Resources
(MEWR)
Ministry of Foreign Affairs
(MFA)
Ministry of National Development
(MND)
Ministry of Finance
(MOF)
Ministry of Transport
(MOT)
Ministry of Trade and Industry
(MTI)
National Research Foundation
(NRF)



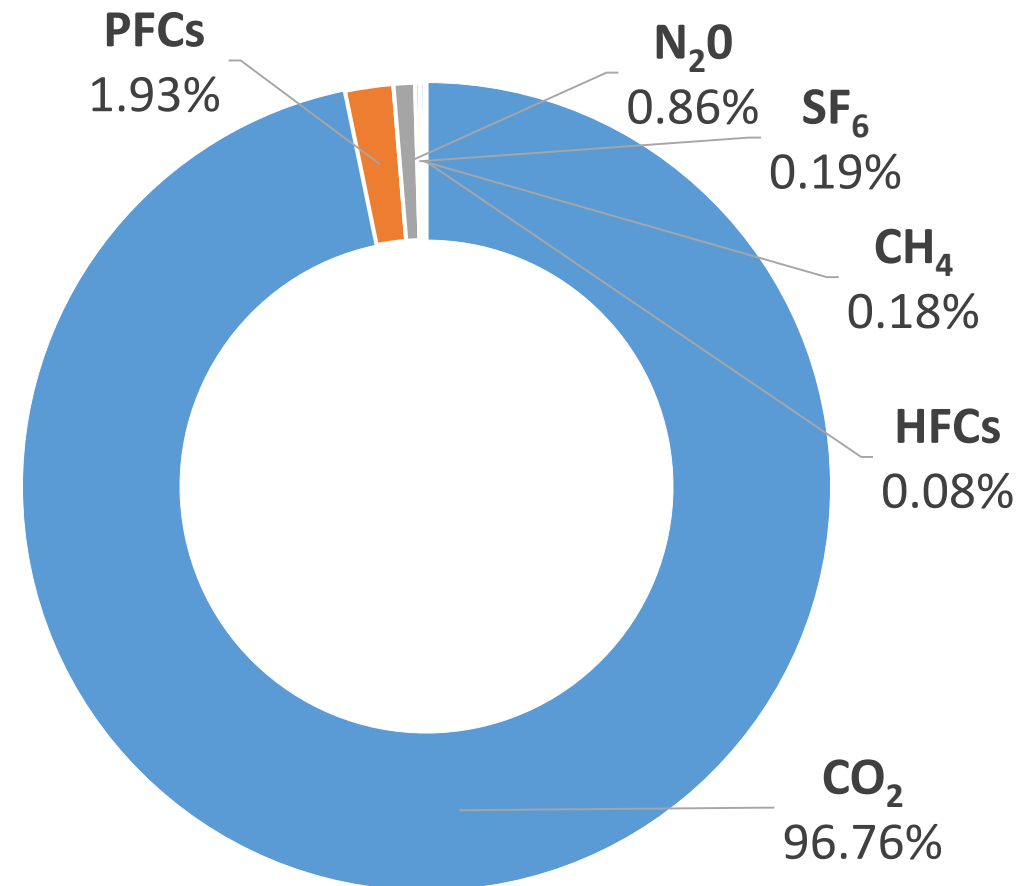
EMISSIONS PROFILE



Total emissions in 2012: 48.09MT

- CO₂ emissions: 46.53MT
- Non-CO₂ emissions: 1.56MT

Percentage contribution of each GHG



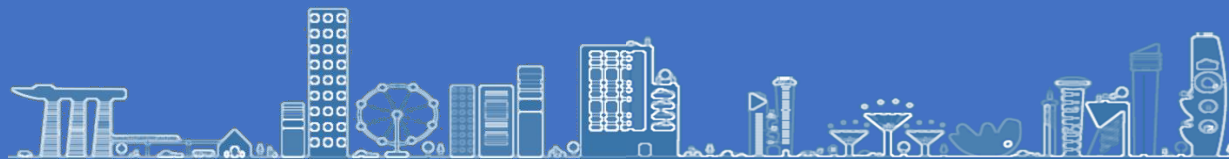
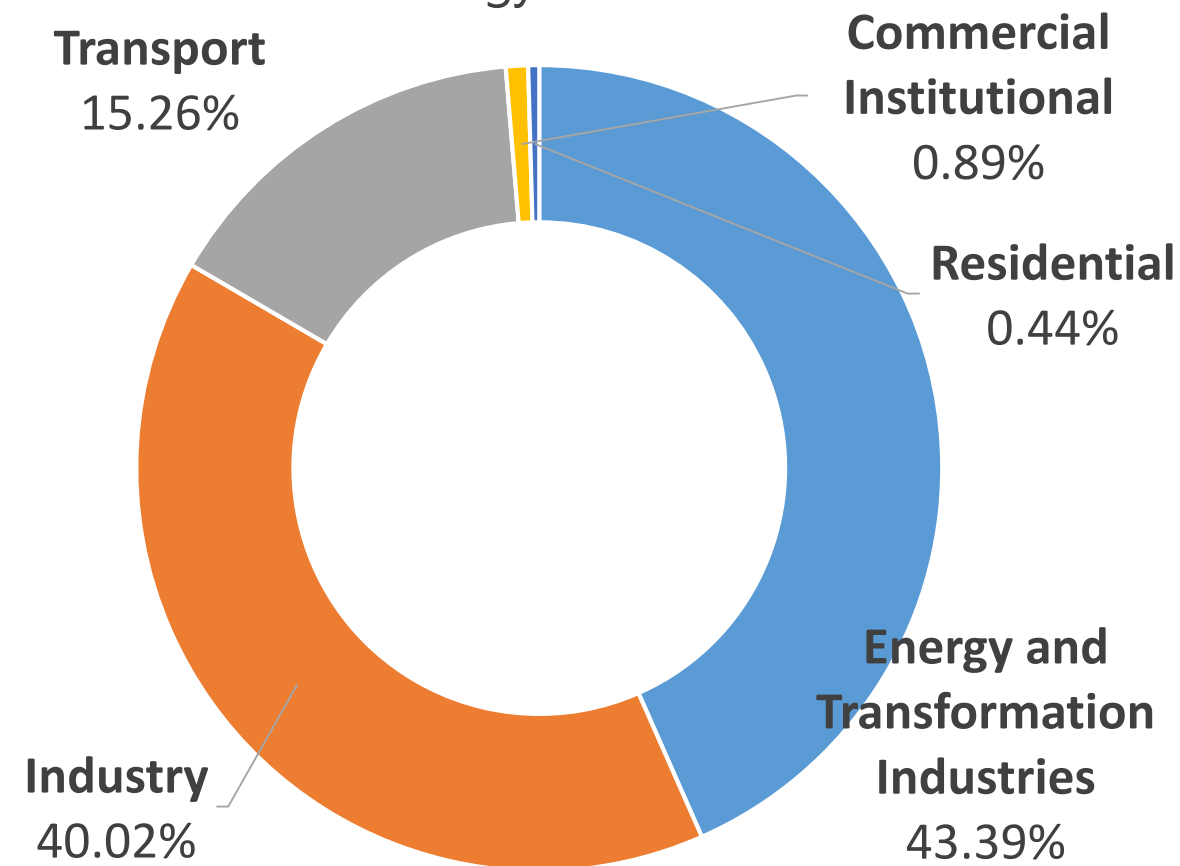
EMISSIONS PROFILE



Total emissions in 2012: 48.09MT

- Energy sector (fuel combustion): 47.12MT

Breakdown of Emissions from Fuel Combustion in Energy Sector



EMISSIONS PROFILE



Total emissions in 2012: 48.09MT

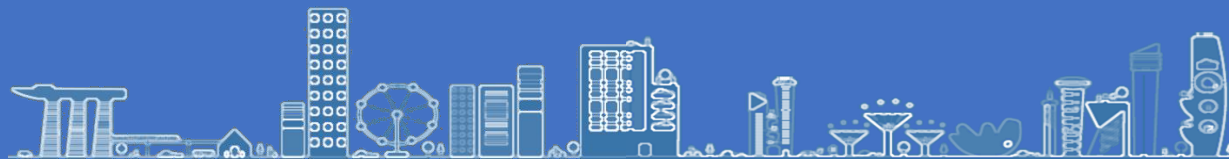
- LULUCF sector net removal: -0.24MT

Reported LULUCF emissions for the first time in 2nd BUR

Since 2013, Singapore's NParks has been engaging international experts to set up LULUCF removals and emissions data system

Wall to wall assessment of land-use and land-use changes using satellite imagery covering all land-use categories and 5 carbon pools carried out

Permanent sampling plots for tracking carbon in relevant land-use categories established



2020 PLEDGE

Reduce GHG emissions by 16% below Business-As-Usual (BAU)

Parameters	Targets
Gases Covered	Carbon Dioxide (CO ₂), Methane (CH ₄), Nitrous Oxide (N ₂ O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur Hexafluoride (SF ₆)
Coverage	Pledge does not exclude any sectors. Key mitigation measures in following sectors: Energy, industrial processes, transport, commercial, residential, and waste
Funding	Domestic resources



KEY MITIGATION MEASURES



Buildings

- Green Mark Certification for all new buildings and existing buildings when retrofitted
- Improve energy efficiency of tenanted spaces

Households

- Mandatory Energy Labelling Scheme (MELS)
- Minimum Energy Performance Standards (MEPS)
- Smart home technologies

Power generation

- Adopt more efficient technologies
- Increase deployment of solar PVs

Industry

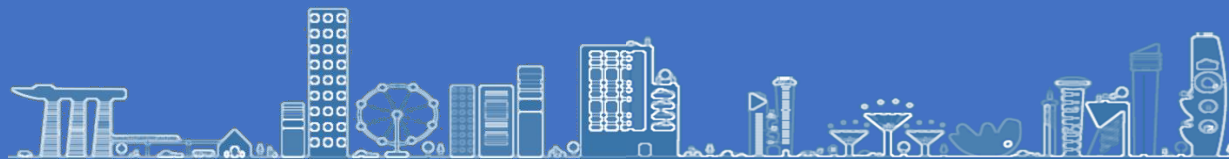
- Improve energy efficiency
- Encourage new co-generation plants

Transport

- Increase public transport modal share
- Improve fuel efficiency of private vehicles
- Test-bed electric vehicles

Waste and water

- Increase overall recycling rate
- Reduce plastics incineration
- Improve efficiency of desalination and used water treatment



INDUSTRY



Industry

- Improve energy efficiency
- Encourage new co-generation plants

Achieve energy efficiency improvement for manufacturing sector

Regulation

- Energy Conservation Act
- Minimum Energy Performance Standards

Capability Development

- Singapore Certified Energy Manager Programme
- Energy Efficiency National Partnership

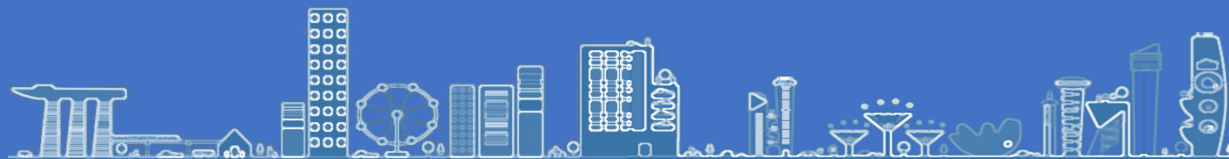
Incentives

- Energy Efficiency Grants for Manufacturing Companies
- Investment Allowance for Energy Efficiency

Financing

- Energy Efficiency Financing Pilot-Programme

Encourage new co-generation plants



BUILDINGS



Buildings

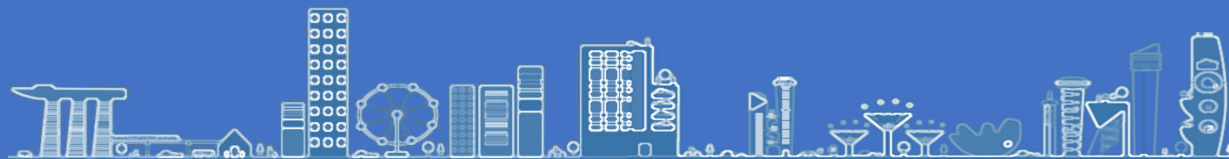
- Green Mark Certification for all new buildings and existing buildings when retrofitted
- Improve energy efficiency of tenanted spaces



Achieve Green Mark Standards for 80% of buildings by 2030

Improve energy efficiency of tenanted spaces

Disclosure of annually submitted building information and energy consumption data



TRANSPORT



Transport

- Increase public transport modal share
- Improve fuel efficiency of private vehicles
- Test-bed electric vehicles

Increase public transport modal share to 75% by 2030

Expand rail network to 360km by 2030

Extend bus network

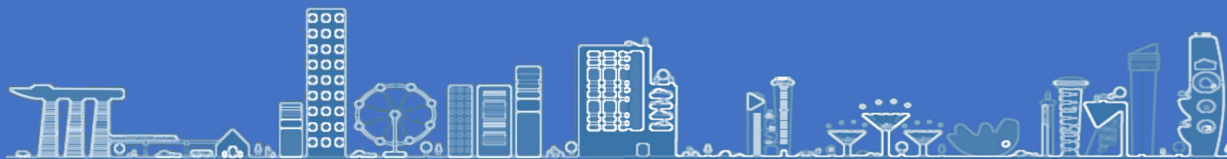
Build integrated transport hubs

Encourage walking and cycling

Quadruple sheltered walkway to 200km by end 2018

Manage private car ownership and usage through:

- Certificate of Entitlement (COE)
- Zero annual growth rate
- Electronic Road Pricing (ERP)



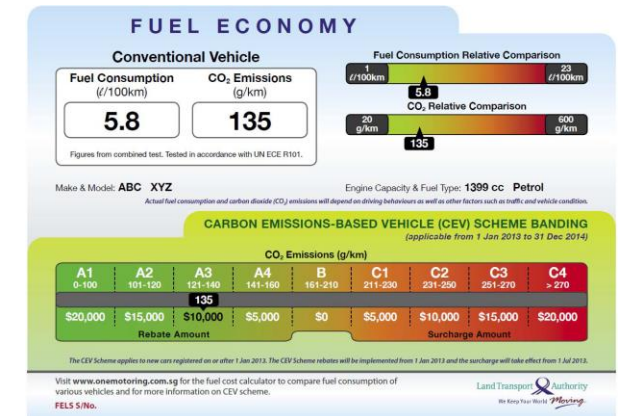
TRANSPORT



Improve fuel efficiency of private vehicles

Vehicle Emissions Scheme

Fuel Economy Labelling Scheme



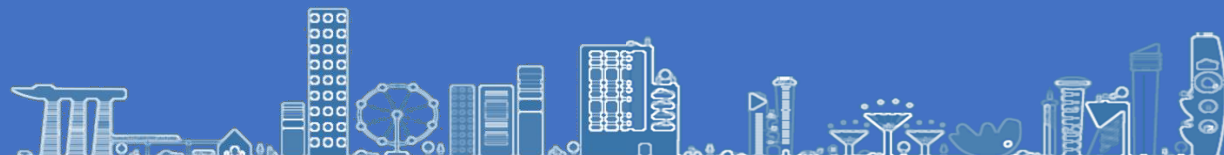
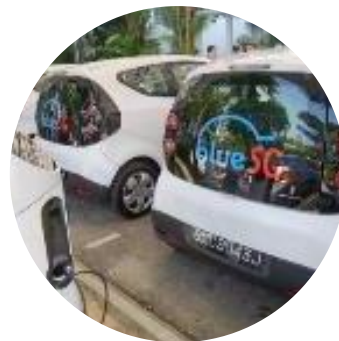
Test-bed electric vehicles

1000 EVs and 2000 charge kiosks by 2020

Fleet-based trials of e-buses and e-taxis

Transport

- Increase public transport modal share
- Improve fuel efficiency of private vehicles
- Test-bed electric vehicles



HOUSEHOLDS



Households

- Mandatory Energy Labelling Scheme (MELS)
- Minimum Energy Performance Standards (MEPS)
- Smart home technologies

Mandatory Energy Labelling Scheme (MELS)

For lighting, televisions, air-conditioners, fridges, clothes dryers

Introduced since 2008, progressively expanded to include more appliances

Minimum Energy Performance Standards (MEPS)

For lighting, air-conditioners, fridges, clothes dryers

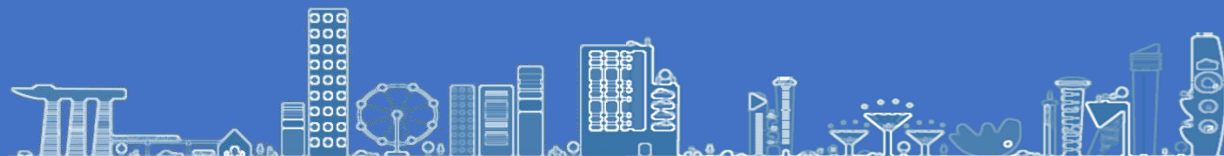
Introduced since 2011, progressively expanded to include more appliances

Smart Home Technologies

Pilot programmes to assess feasibility

Redesigned utility bill

Includes energy conservation tips and peer comparison



WASTE AND WATER



Waste and water

- Increase overall recycling rate
- Reduce plastics incineration
- Improve efficiency of desalination and used water treatment



Waste

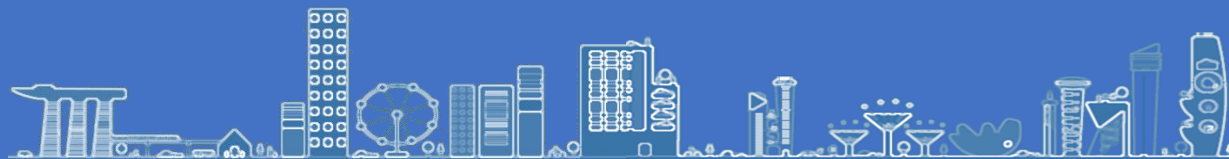
Increase recycling rate to 70% by 2030

Reduce plastics incineration

Water

New water treatment technologies which use less energy

Pilot on co-digestion of food waste with water sludge which produces more biogas that can be used to generate electricity



POWER GENERATION



Power generation

- Adopt more efficient technologies
- Increase deployment of solar PVs



Adopt more efficient technologies

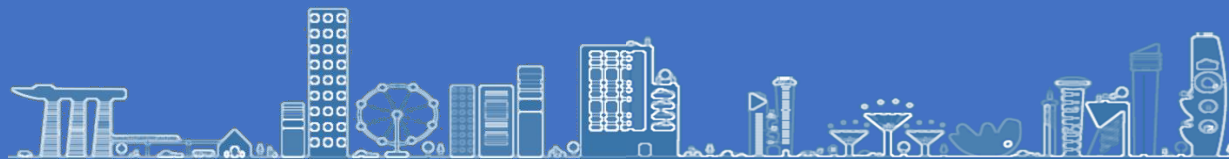
Waste to Energy (WTE) plants which optimise resource and energy recovery

Increase deployment of solar PVs

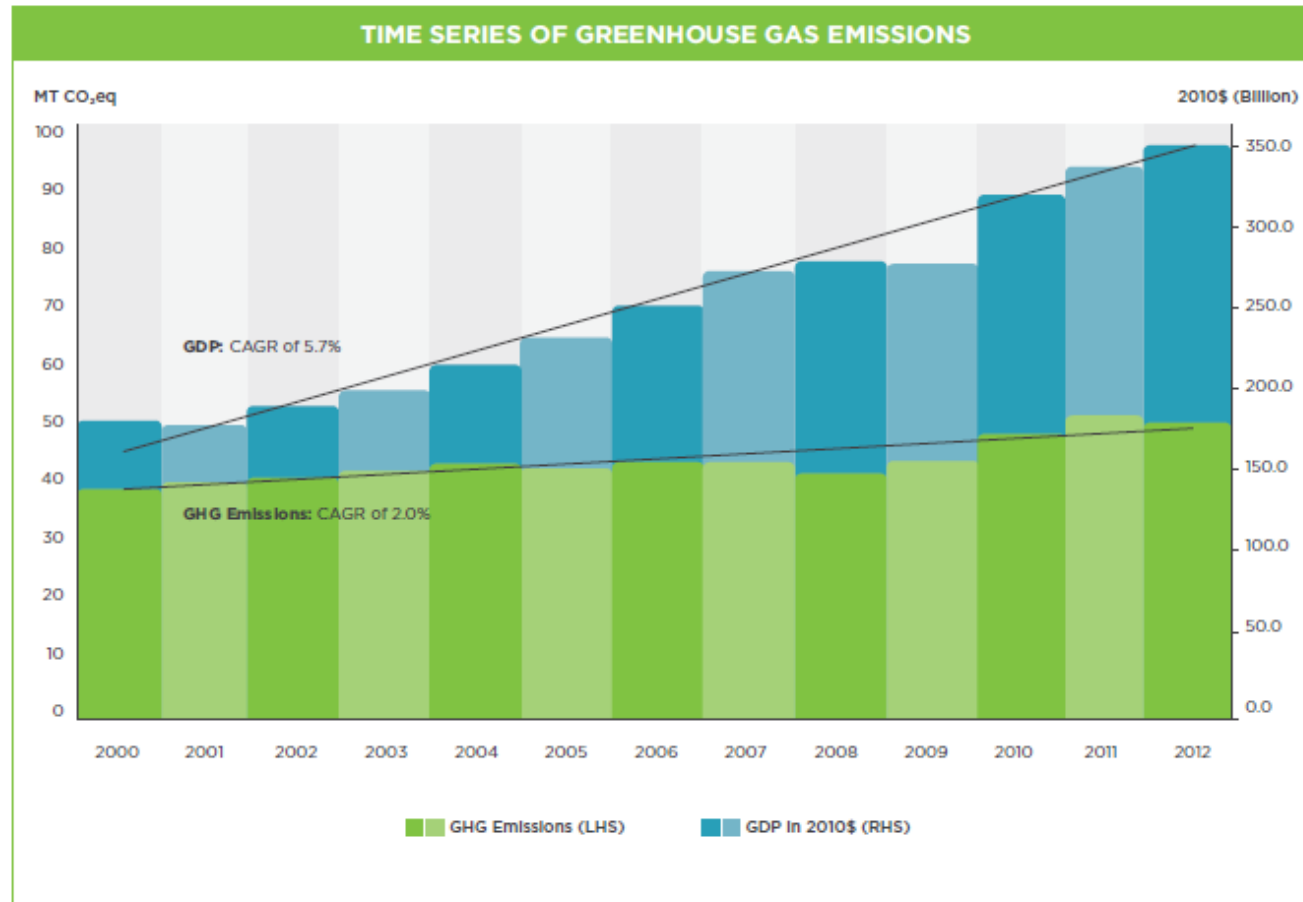
350MWp by 2020, and 1GWp thereafter

SolarNova programme

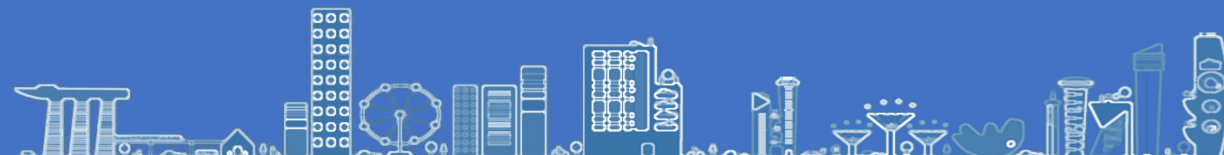
Test-bedding floating solar panels



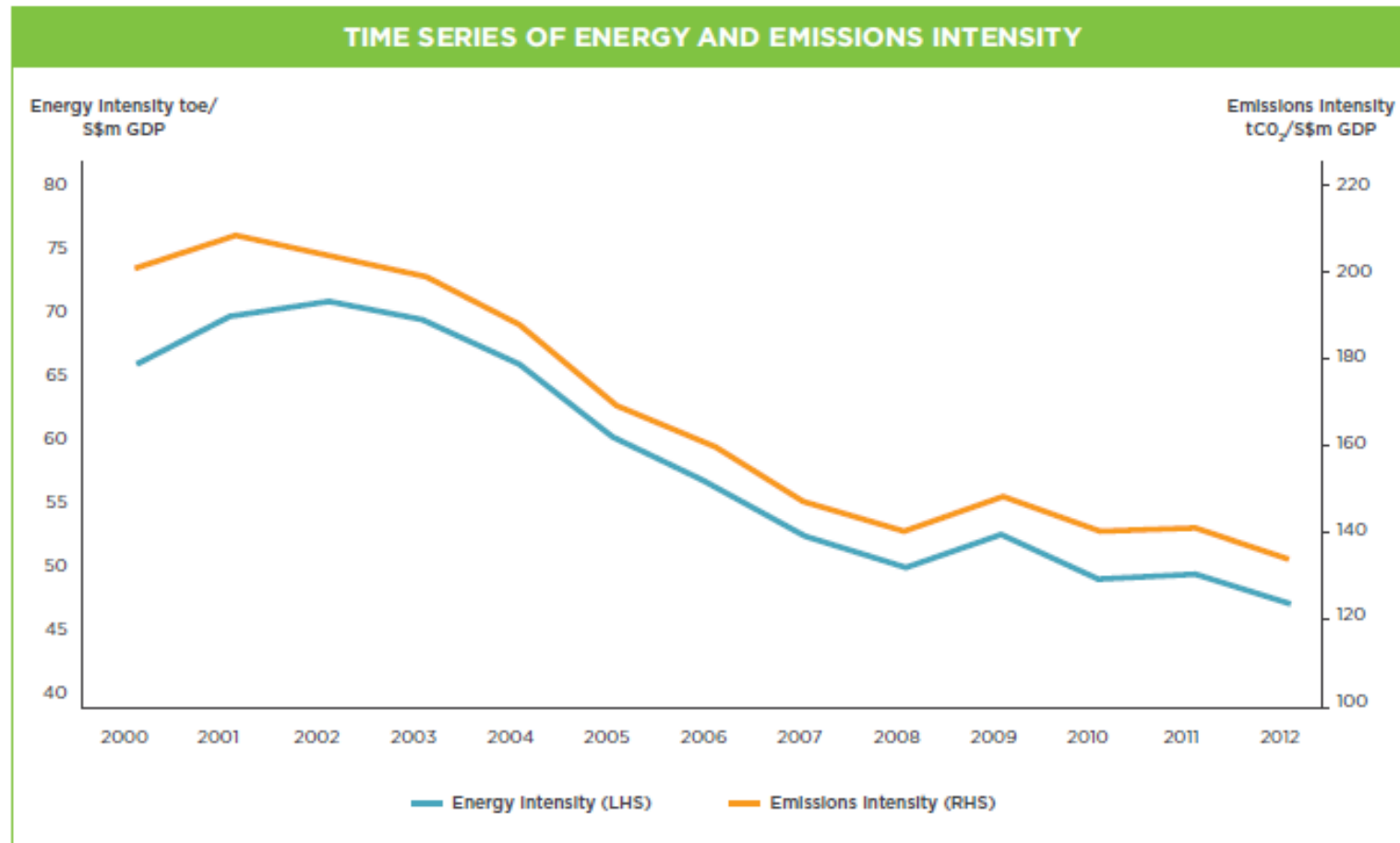
GDP AND EMISSIONS



Singapore's GDP grew at a CAGR of 5.7% while GHG emissions grew at a slower rate with a CAGR of 2.0%

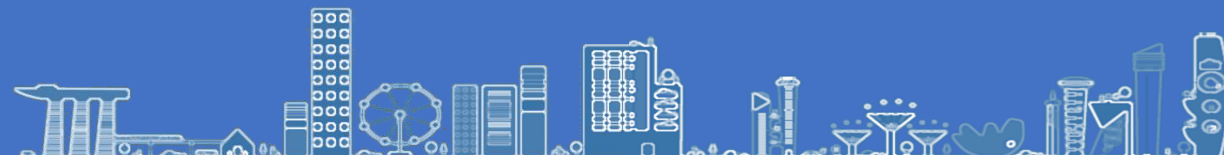


EMISSIONS INTENSITY

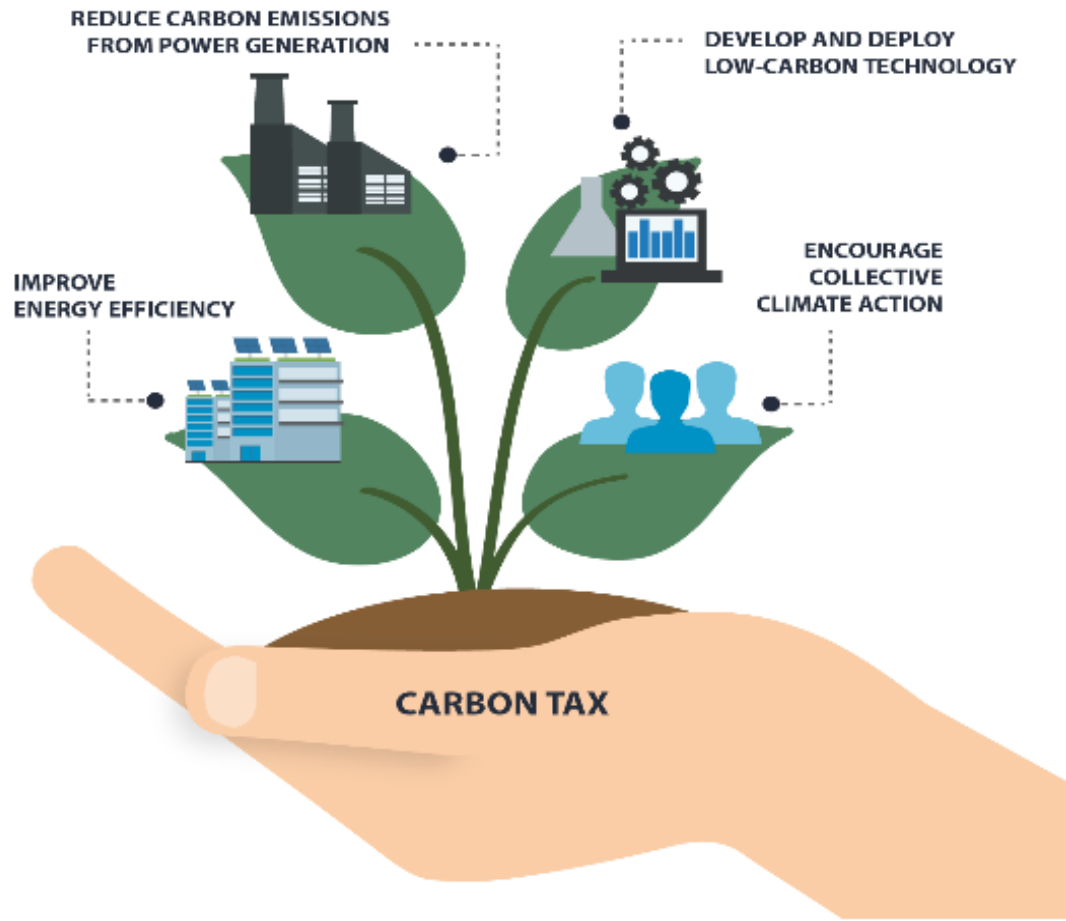


Emissions Intensity
decreased by around
4% p.a.

Energy intensity
decreased by around
3% p.a.



CARBON TAX



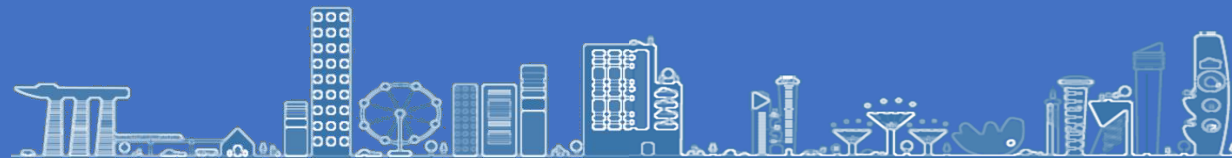
S\$5 per tonne of GHG emissions to be introduced in 2019 for a transition period of 5 years

Intent to increase to S\$10 – S\$15 per tonne of GHG emissions by 2030

No exemptions to maintain a transparent, fair, and consistent price signal across the economy

Covers around 80% of emissions

Price signal on GHG emissions to encourage behavioural changes and incentivise more efficient use of carbon resources



BUR EXPERIENCE

SINGAPORE'S THIRD NATIONAL COMMUNICATION AND FIRST BIENNIAL UPDATE REPORT

Under the United Nations Framework
Convention on Climate Change

December 2014



Approach

Convene BUR preparatory meeting

Identify agency roles and responsibilities

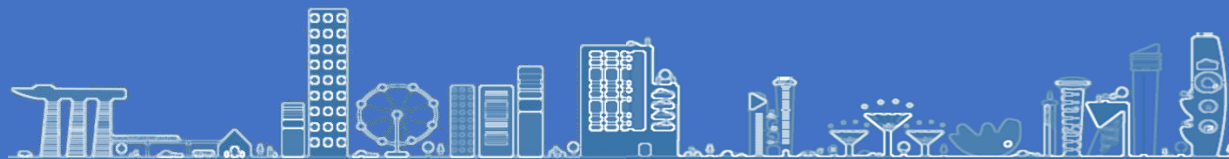
Establish timelines

Address TTE's suggestions

Challenges

Familiarity with guidelines

Ensuring coherence



ICA EXPERIENCE



Approach

Assemble and brief key agencies

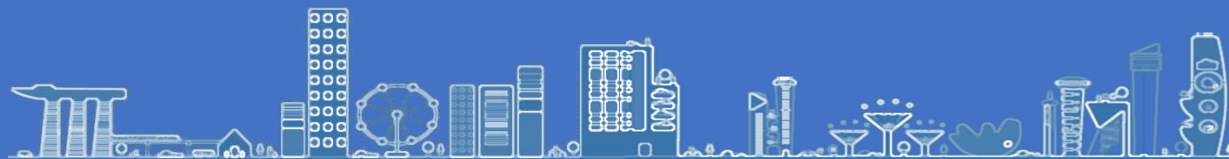
Ensure documentation of data and MRV processes are in order

Identify key contact points

Establish process for quick responses to TTE

Challenge

Ensuring adequate preparations for FSV Q&As



LESSONS LEARNT



Whole of government effort

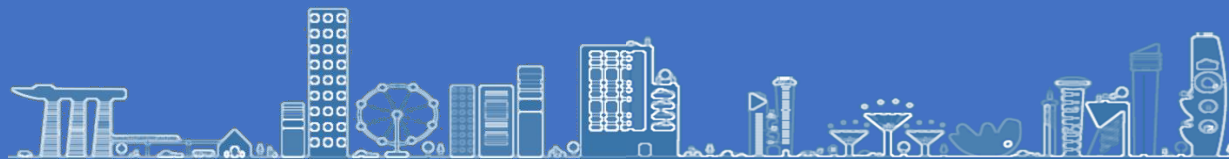
Clear institutional arrangement

Building capacity takes time

Putting in place sustainable systems

“Learn by doing”

Participation in BUR/ICA process



RESPONSES TO QUESTIONS RECEIVED



QUESTION

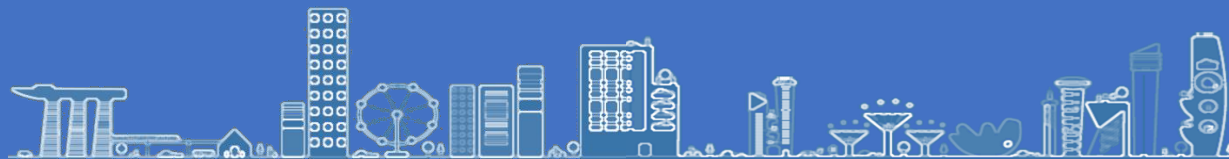
ANSWER

Data on international bunker fuel emissions

Singapore will provide data on international bunker fuel emissions in our 3rd BUR/4th NC. The data will be provided in line with our position that international bunker fuel emissions should not only be excluded from the national total but should also not be part of the national GHG inventory.

HFC emissions from refrigeration and air conditioning

Singapore is developing an interim Tier 1 estimate of HFCs emissions from the refrigeration and air-conditioning (RAC) sector. The estimate will be based on existing data and will guide the preparation of our 3rd BUR/4th NC. Concurrently, we are also in the process of implementing measures to fulfil the relevant reporting obligations under the Kigali Amendment of the Montreal Protocol. When better data becomes available, Singapore will work towards developing a Tier 2 estimate of HFCs emissions from the RAC sector which we will include in our future BUR/NC.



RESPONSES TO QUESTIONS RECEIVED

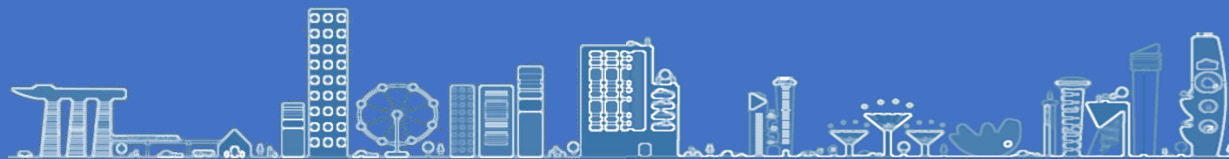


QUESTION

CO₂ emissions from fuel combustion using the reference approach

ANSWER

Singapore will include an explanation in our 3rd BUR/4th NC to clarify our circumstance with regard to CO₂ emissions from fuel combustion using the reference approach. As a global trading hub with a high trade to GDP ratio, Singapore experiences volatility in trade data as a direct result of our large and volatile trade volumes coupled with the presence of a large refining and petrochemical sector. This gives rise to large RE/SE discrepancies which the International Energy Agency (IEA) has also noticed in countries with similar circumstance. As such, emissions calculated using the sectoral approach would be more accurate than using the reference approach in Singapore's context, and we have provided sectoral figures in our previous BUR/NCs. Singapore will include this explanation to enhance the transparency of our BUR.



RESPONSES TO QUESTIONS RECEIVED

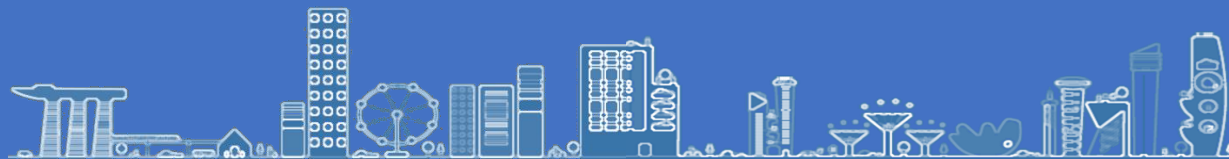
QUESTION

Usage of higher tier emissions estimates

ANSWER

At present, the data required to use a higher tier methodology is only available for some sectors such as emissions of CH₄ and N₂O from the land transport sector; emissions of fluorinated GHGs from integrated circuit and semiconductor production, and LULUCF.

The key challenge in moving to higher tier methodologies is the establishment of data collection processes. We are in the process of putting in place a data collection process which will enable us to estimate HFCs emissions from the refrigeration and air-conditioning sector using the Tier 2 methodology.



RESPONSES TO QUESTIONS RECEIVED

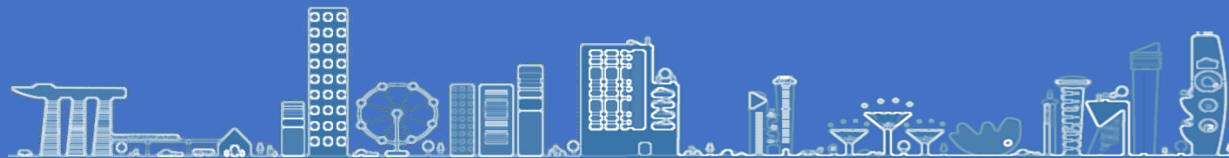


QUESTION

ANSWER

Usage of 2006 IPCC Guidelines

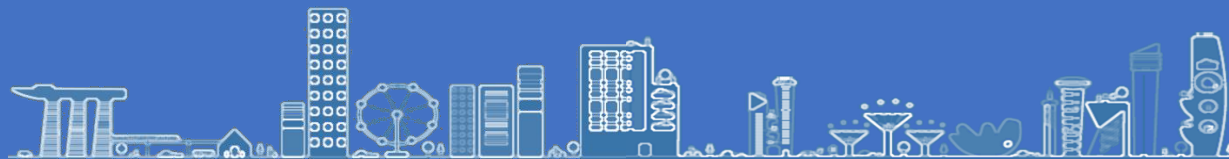
Singapore aims to use the 2006 IPCC guidelines for all sectors and categories in our GHG inventory in due course. We understand that the “2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories” is in-progress. As the overall aim of the refinement is to provide an updated scientific basis (where gaps or out-of-date science have been identified) for the preparation of national greenhouse gas inventories, we aim to switch completely to 2006 IPCC guidelines after the refinement is completed.



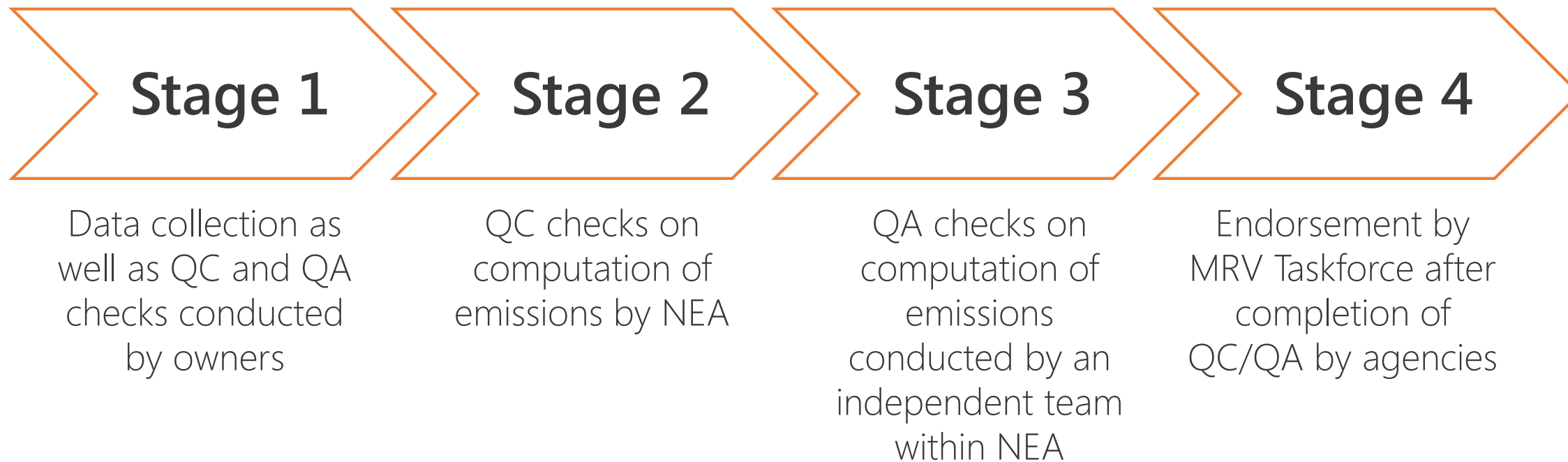
THANK YOU



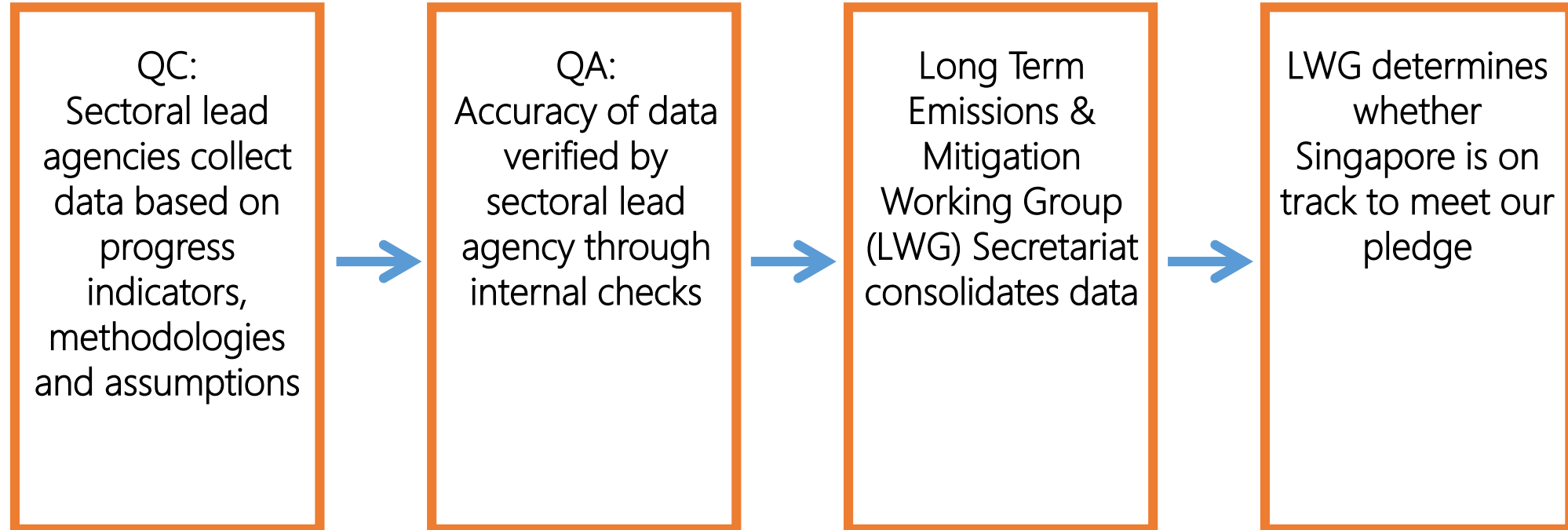
Supplementary slides



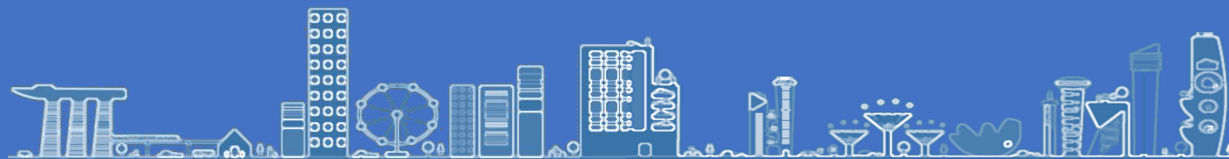
GHG INVENTORY PREPARATION



dMRV



QC – Quality Control
QA – Quality Assurance



GHG INVENTORY

Greenhouse Gas Source and Sink Categories	CO ₂	CH ₄	N ₂ O	HFCs	PFCs	SF ₆
Total (Net) National Emissions - (Gg CO₂eq)	46,538.16	86.73	411.68	37.92	930.83	89.33
All Energy	46,777.39	41.20	307.04			
Fuel combustion	46,551.87	41.20	307.04			
Energy and transformation industries	20,366.57	9.02	73.03			
Industry	18,610.71	8.65	14.47			
Transport	6,946.58	23.50	219.54			
Commercial-institutional	419.41	0.03	0.01			
Residential	208.61					
Fugitive fuel emission	225.52					
Oil and natural gas system ²	225.52					
Land Use, Land-Use Change and Forestry	-239.23		0.02			
Industrial Processes				37.92	930.83	89.33
Waste		45.53	104.62			
Wastewater Handling		45.53	104.62			

*Blank cell means Not Occurring



KEY CATEGORY ANALYSIS

Key Category Analysis						
	IPCC Category		Type of Greenhouse Gas	Emissions (kt CO ₂ eq)	Percentage Contribution	Cumulative
1	Energy and Transformation Industries	Natural Gas	CO ₂	14,955.61	30.79%	30.79%
2	Industry	Refinery Gas	CO ₂	10,108.63	20.81%	51.60%
3	Land Transport	Diesel	CO ₂	4,122.95	8.49%	60.09%
4	Energy and Transformation Industries	Fuel Oil	CO ₂	3,604.13	7.42%	67.51%
5	Industry	Fuel Oil	CO ₂	3,600.81	7.41%	74.92%
6	Industry	Natural Gas	CO ₂	3,095.42	6.37%	81.29%
7	Land Transport	Petrol	CO ₂	2,296.85	4.73%	86.02%
8	Energy and Transformation Industries	Municipal Solid Waste ⁹	CO ₂	1,368.67	2.82%	88.84%
9	Industry	Diesel	CO ₂	1,256.48	2.59%	91.43%
10	Industrial Processes	-	PFCs	930.83	1.92%	93.35%
11	Transport (Marine Craft)	Diesel	CO ₂	480.91	0.99%	94.34%
12	Industry	Petroleum Coke	CO ₂	445.40	0.92%	95.26%

