

Energy Conservation Act

Improving Energy Efficiency in the Industrial Sector

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Objectives

To present:

- 1 Background
- 2 Key Findings from 2015 Energy Use Reports and Energy Efficiency Improvement Plans
- 3 New measures under the ECA

1 Background

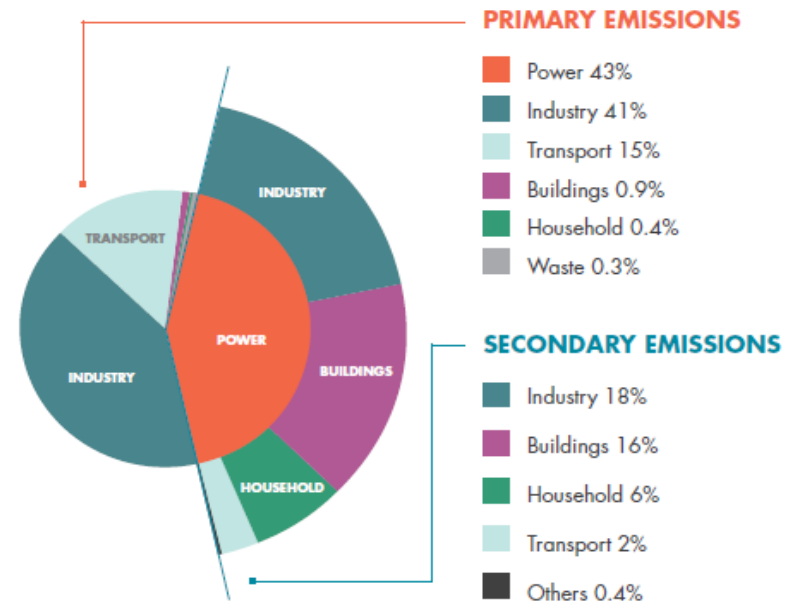
Background

Singapore's GHG Emissions & Mitigation Plan

- Singapore ratified the Paris Agreement and formalised its pledge to reduce its emissions intensity by 36% below 2005 levels by 2030 and stabilise its emissions with the aim of peaking around 2030

- Improving energy efficiency (EE) is a key strategy to reduce energy use and help companies remain competitive

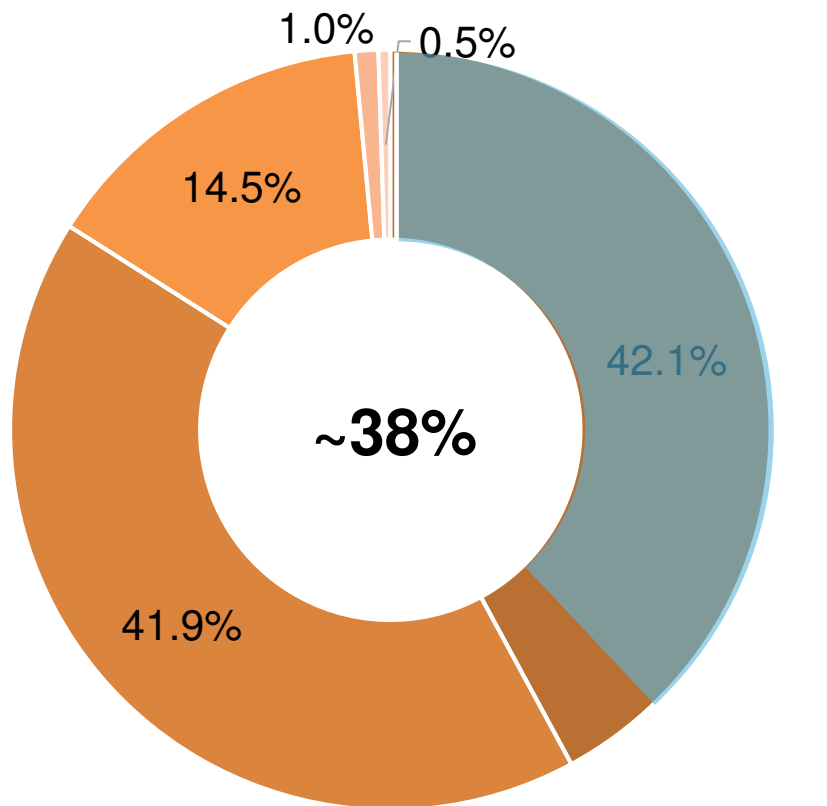
- **1-2%** EE improvement per year by industry sector required to achieve 2030 target



Industry sector accounted for the largest share of Singapore's emissions

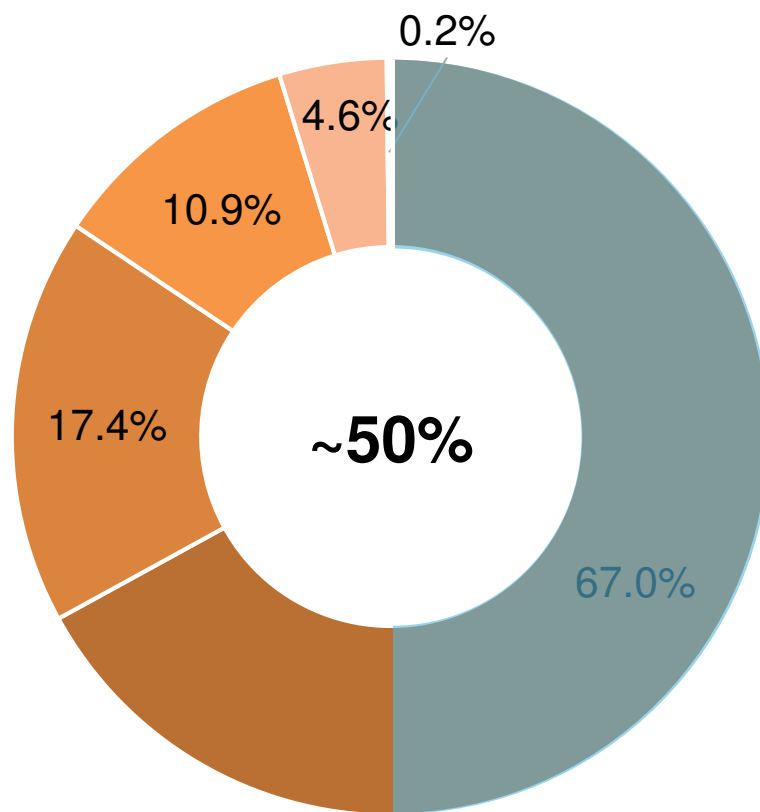
Refineries, Petrochemical and Chemical Facilities Account for a Large Share of Singapore's Energy Consumption

Primary Energy Consumption



- Industrial
- Transport
- Household
- Energy & transformation
- Commerce & service

Final Energy Consumption



- Industrial
| Commerce & service |
| Transport |
| Household |
| Others |

* Based on 2015 energy consumption data

2 Key Findings from 2015 ECA Energy Use Reports and Energy Efficiency Improvement Plans

Regulation and Standards



Industrial

✓ **Mandatory Energy Management Practices under Energy Conservation Act (ECA)**

- Energy management practices introduced for industrial sector* in Apr 2013
- Requires energy-intensive companies in industrial sector consuming 54 TJ of energy or more each year to:
 - Appoint at least one energy manager;
 - Monitor and report energy use and GHG emissions annually; and
 - Submit an energy efficiency improvement plan and review it annually
- 182 companies operating 231 energy-intensive facilities are regulated under ECA

* Covers manufacturing, utilities and sewage & waste management companies

Refineries, Petrochemical and Chemical Facilities Overview

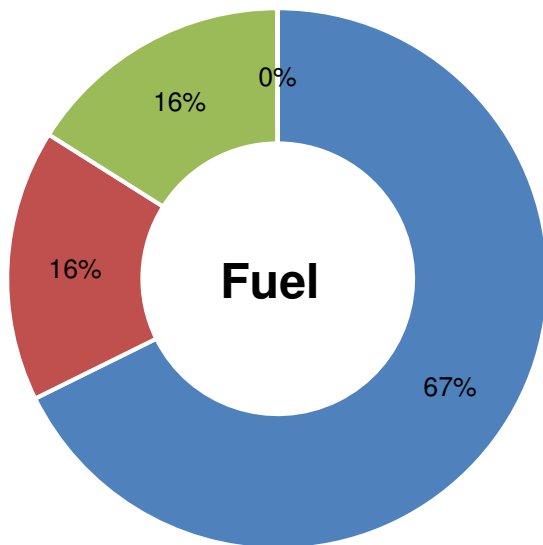
	2013	2014	2015
No. of Companies	48	48	50
No. of Premises	63	63	65
Total Energy Consumption	314 PJ	323 PJ	331 PJ

	2014-2018 (Projected)	2014 (Implemented)	2015-2019 (Projected)	2015 (Implemented)
No. of EE measures	179	47	196	88
Annual energy savings	6,331 TJ	1,009 TJ	7,336 TJ	1,590 TJ
Est. investment cost	\$880 mil	\$17.4 mil	\$1,226 mil	\$42.4 mil
Avg % annual energy reduction	0.6% (2014/15)	0.3%	0.9% (2015/16)	0.5%

Implemented Projects Fall Short of Projection

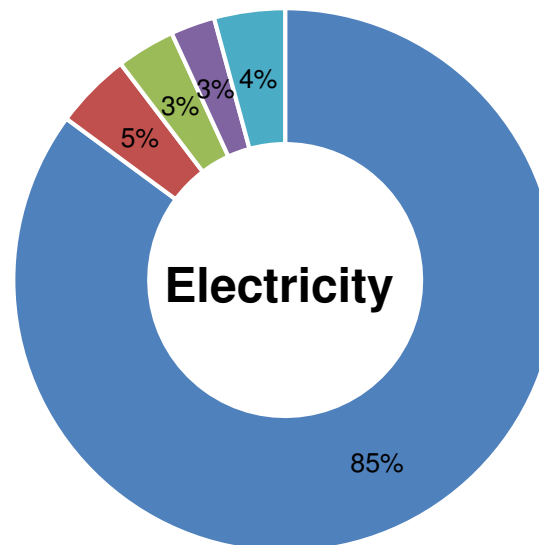
Refineries, Petrochemical and Chemical System-Level Energy Use

Fuel Consuming Systems



- Direct heating (furnaces)
- Indirect heating (boilers/hot oil systems)
- Co-generation

Electricity Consuming Systems



- Motor Driven Systems
- Process Specific Systems
- Compressed Air Systems
- Cooling & Refrigeration Systems
- Others

Findings:

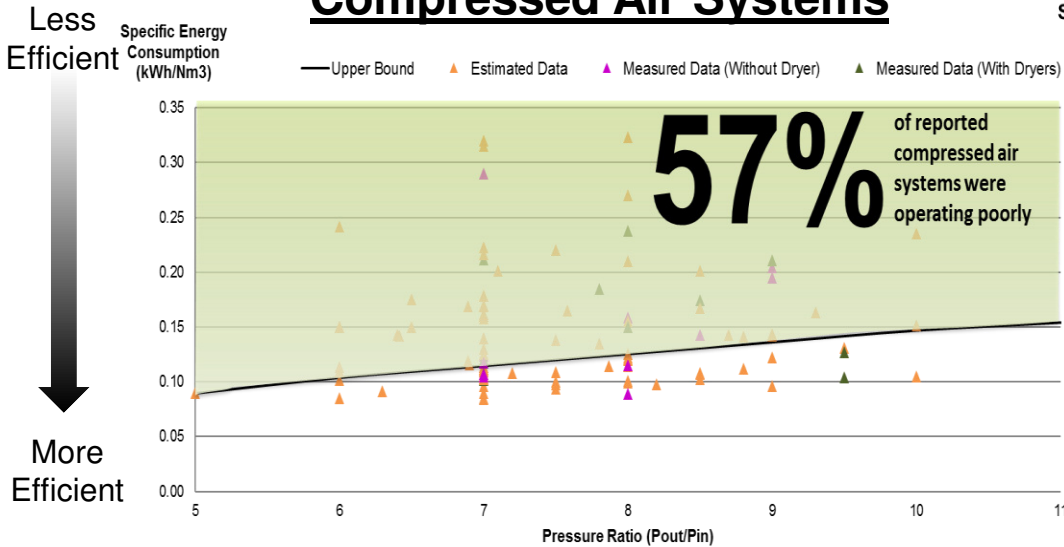
- Heating systems were top users of fuels
- Motors accounted for about 80% of total electricity consumption

- **NEA plans to call a consultancy study on heating systems to help companies better understand the current performance and identify improvement measures for their heating systems.**

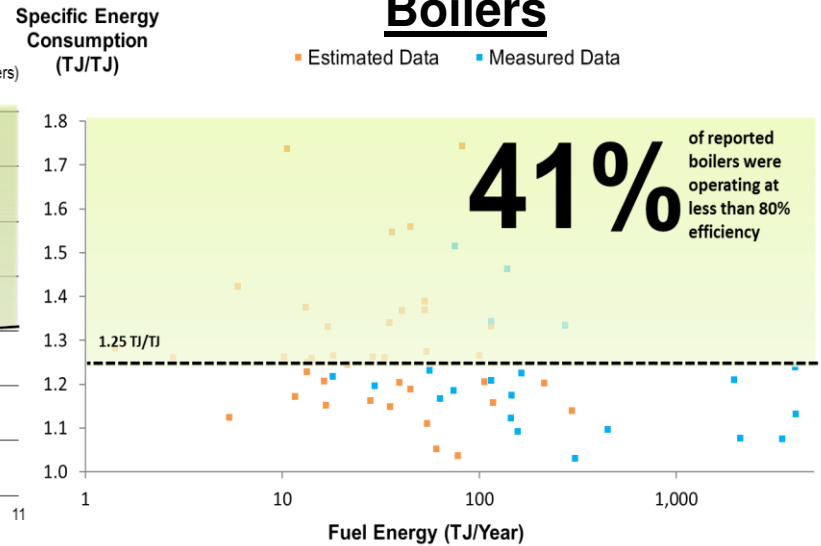
All Companies

Energy Performance of Common Systems

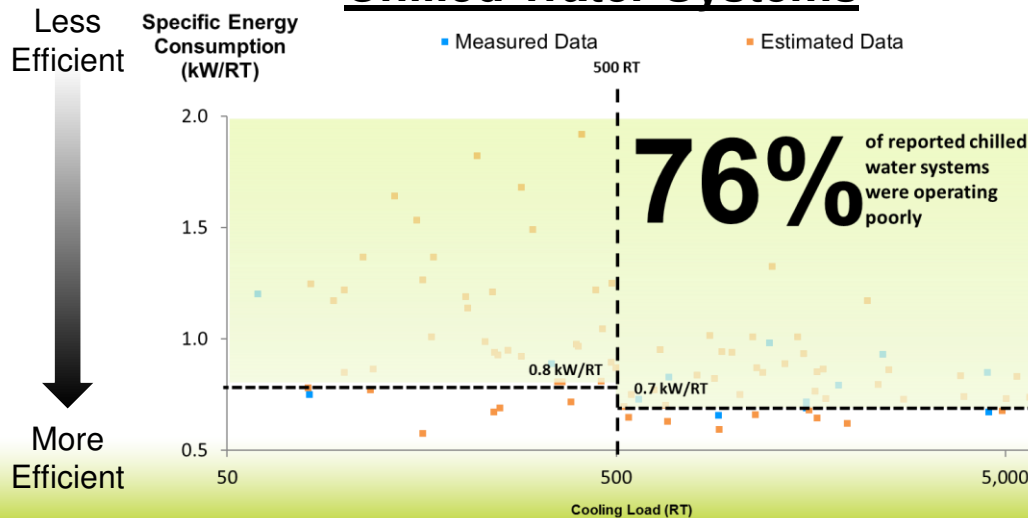
Compressed Air Systems



Boilers

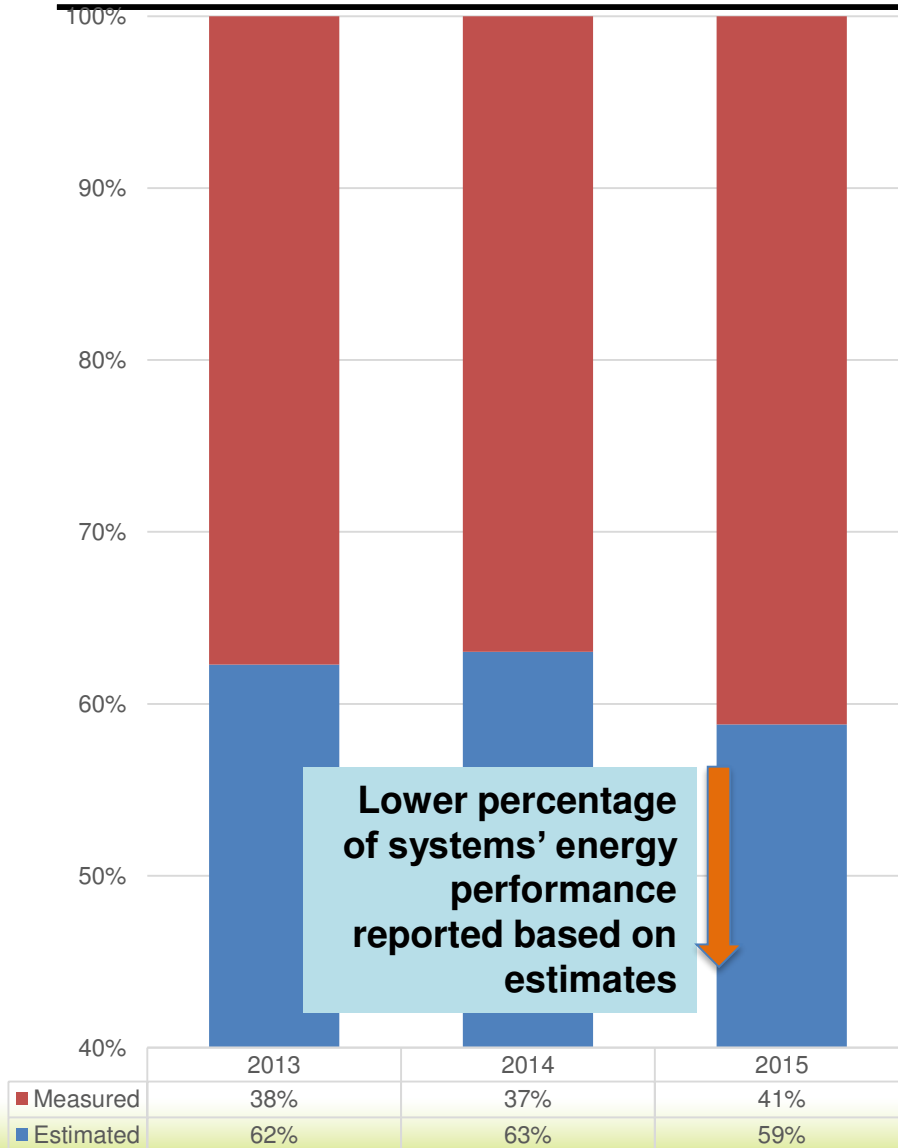


Chilled Water Systems



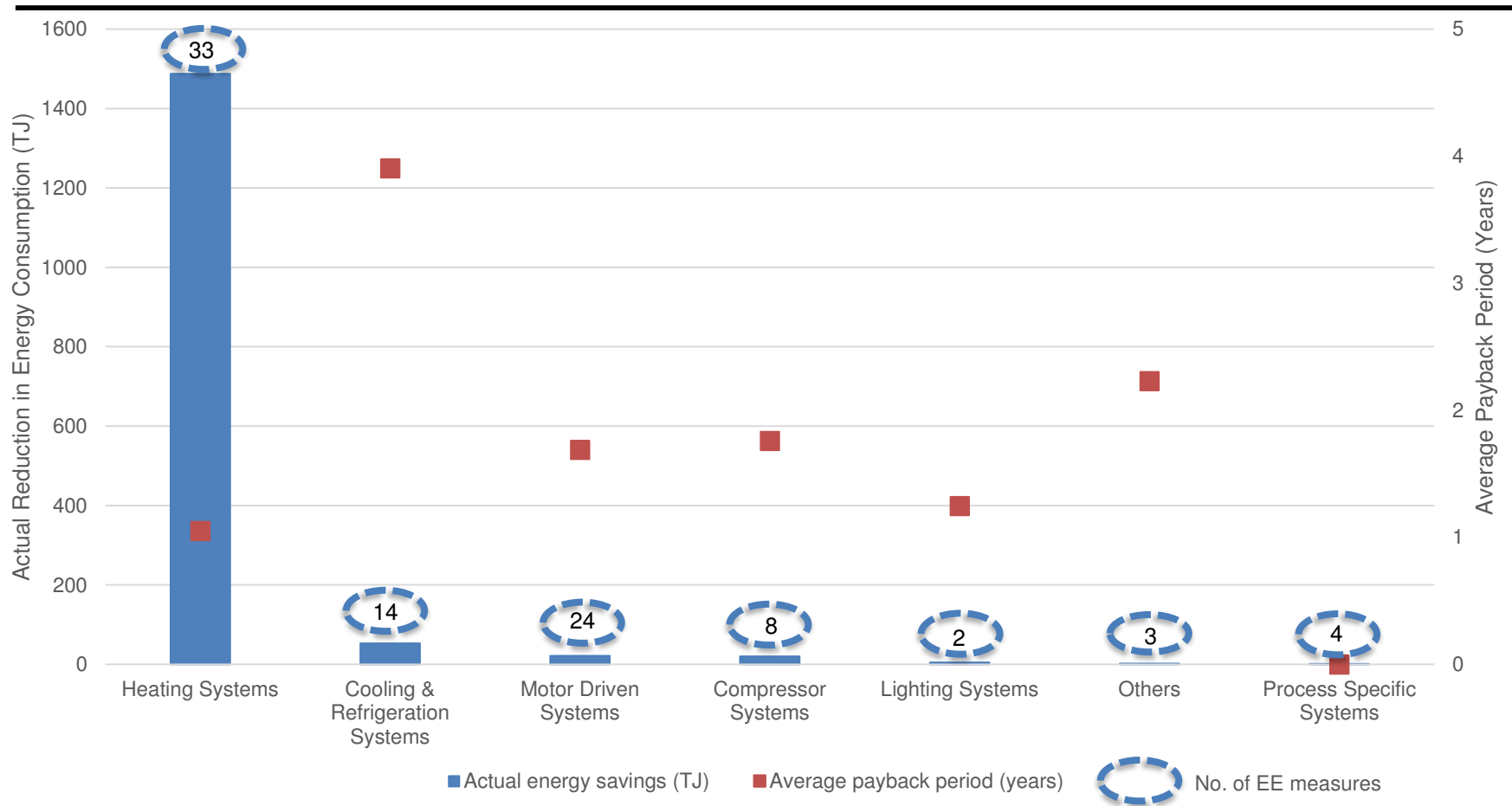
All Companies

System-Level Reporting (Measurement)



- 59% of reported systems' energy performance were estimates
 - Slight improvement from 2013 (62%) and 2014 (63%)
- More investment in proper energy performance monitoring and reporting tools needed to increase the proportion of systems with properly tracked energy performance indicators

Refineries, Petrochemical and Chemical Facilities EE Measures Implemented in 2015

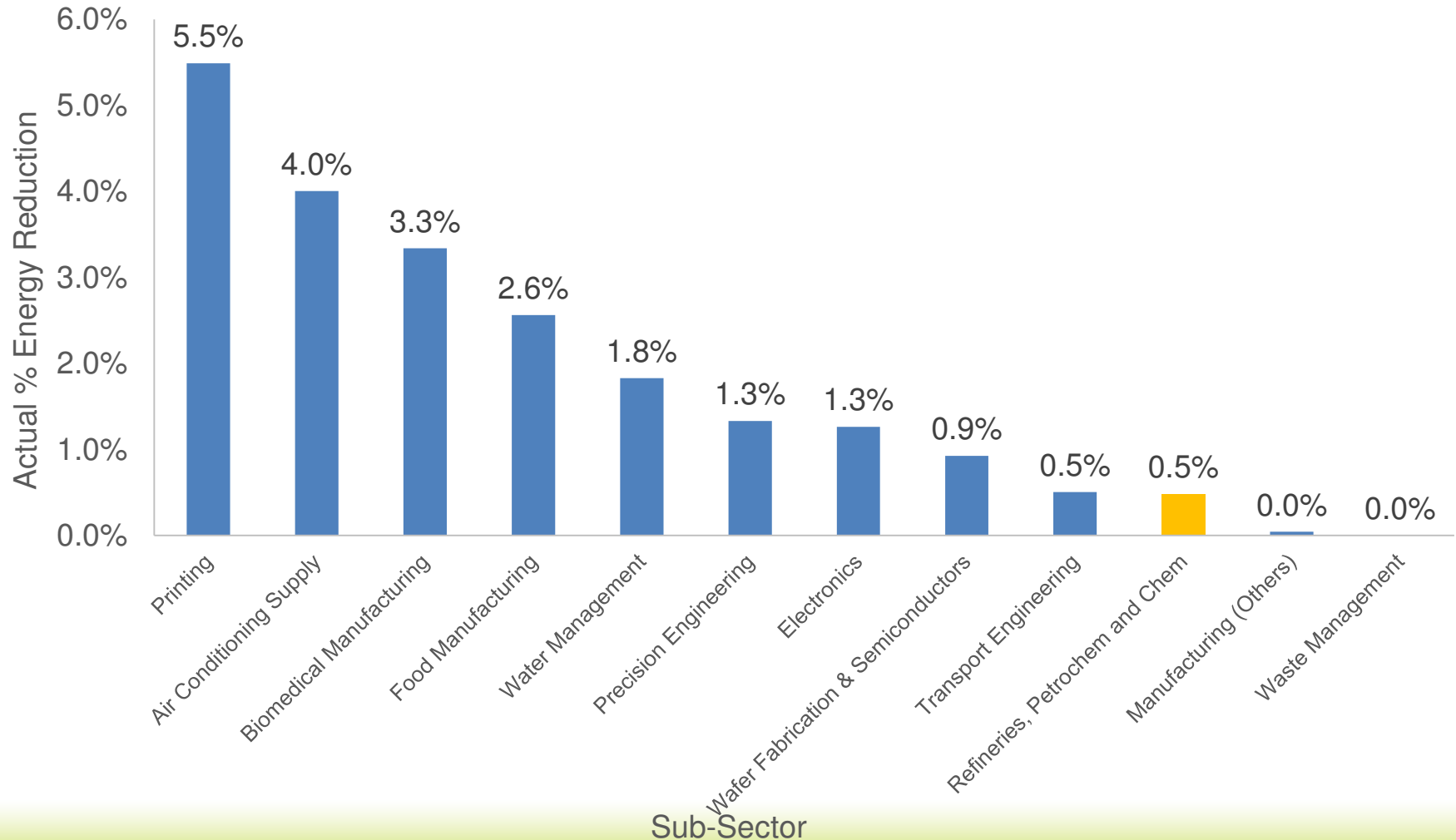


EE measures related to heating systems yielded the most significant energy savings, e.g.

- Recover waste heat from exothermic reaction and flue gas
- Use of improved catalyst
- Optimise operating parameters such as product purity and temperature

EE Improvement is Relatively Low in the Refineries, Petrochemical and Chemical Sub-Sectors

Actual % Energy Reduction from Projects Implemented in 2015



Incentive and Financing Schemes

Support is Available to Improve EE

E2F

Up to **\$600,000** for design workshops for new facilities or major expansions

Resource
Efficient
Design

Energy
Assessment

E2F

Up to **\$200,000** for energy audits on existing facilities

Energy Efficient
Technologies

Energy Efficiency Fund (E2F)

Up to **30%** of investment cost for adoption of EE technologies by SMEs

Productivity Grant

Up to **20%** of investment cost for adoption of EE technologies by non-SMEs

EE Financing

Up to **100%** of upfront capital investment, financed from a paid-from-savings basis

3 New measures under the ECA



Summary of Revised Industrial Energy Efficiency Requirements

Proposed requirement	Details	
Enhanced energy management practices for existing facilities	<p align="center"><u>Most energy-intensive facilities</u> <u>Consumption ≥ 500TJ/yr</u></p> <ul style="list-style-type: none"> • Structured EnMS by 2021 • EE opportunities assessments (EEOA) <ul style="list-style-type: none"> ✓ 1st EEOAs by 2021 and every 6 yrs thereafter ✓ Cover at least 80% of energy consumption 	<p align="center"><u>Next tier energy-intensive facilities</u> <u>Consumption 54 – 500TJ/yr</u></p> <ul style="list-style-type: none"> • Structured EnMS by 2022 • EE opportunities assessments (EEOA) <ul style="list-style-type: none"> ✓ 1st EEOAs by 2021 ✓ Review every 3 yrs the need for subsequent EEOAs ✓ Cover at least 80% of energy consumption
Energy performance measurement (EPM) requirements for New Ventures	<p align="center"><u>All new energy-intensive New Ventures i.e. ≥ 54TJ/yr (from 2018)</u></p> <ul style="list-style-type: none"> • Design and construction phase <ul style="list-style-type: none"> ✓ Plan for and install instruments and meters at system level • Operations phase <ul style="list-style-type: none"> ✓ Report energy use and energy performance indicators based on measured data <ul style="list-style-type: none"> ➢ Cover energy-consuming systems that account for at least 80% of total consumption 	
EEOA for New Ventures	<p align="center"><u>All new energy-intensive New Ventures i.e. ≥ 54TJ/yr (from 2018)</u></p> <ul style="list-style-type: none"> • Design phase <ul style="list-style-type: none"> ✓ Review facility design, develop economically feasible energy/carbon efficiency measures for incorporation into the new facility and report findings 	
MEPS for common industrial equipment & systems	<ul style="list-style-type: none"> • MEPS to be set at premium efficiency level for single speed 3-phase induction motors (from 2018) • MEPS to be extended to other common industrial equipment and systems over time 	

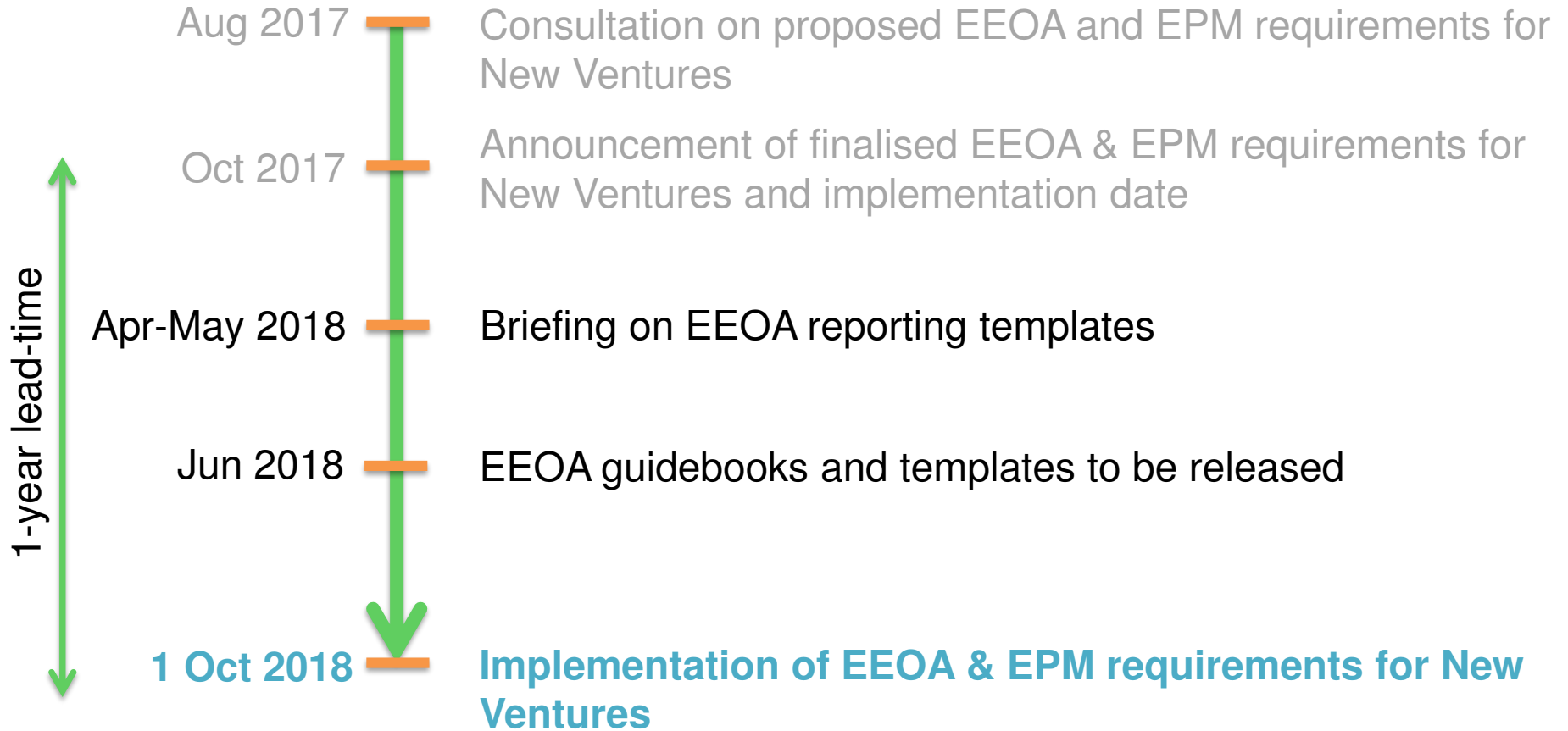
Implementation Timeline

		2018	2019	2020	2021	2022
EEOA for New Ventures (NVs)		1 Oct				
EPM for NVs		1 Oct				
MEPS for common industrial equipment & systems*		1 Oct (Motors)				
Enhanced energy management practices for existing facilities	1 st EEOA					
	EnMS [for facilities \geq 500TJ/yr]					
	EnMS [for facilities 54- 500TJ/yr]					

*MEPS for other common industrial equipment & systems will be introduced progressively.

 Effective Date

Timeline of Requirements for New Ventures



Our Environment

Safeguard • Nurture • Cherish