

Primary Drivers of Energy Intensity Reductions






EGEEC 60 Meeting, Hong Kong, China

16 March 2023

Zhichao LI, Senior Researcher, Asia Pacific Energy Research Centre (APERCC)



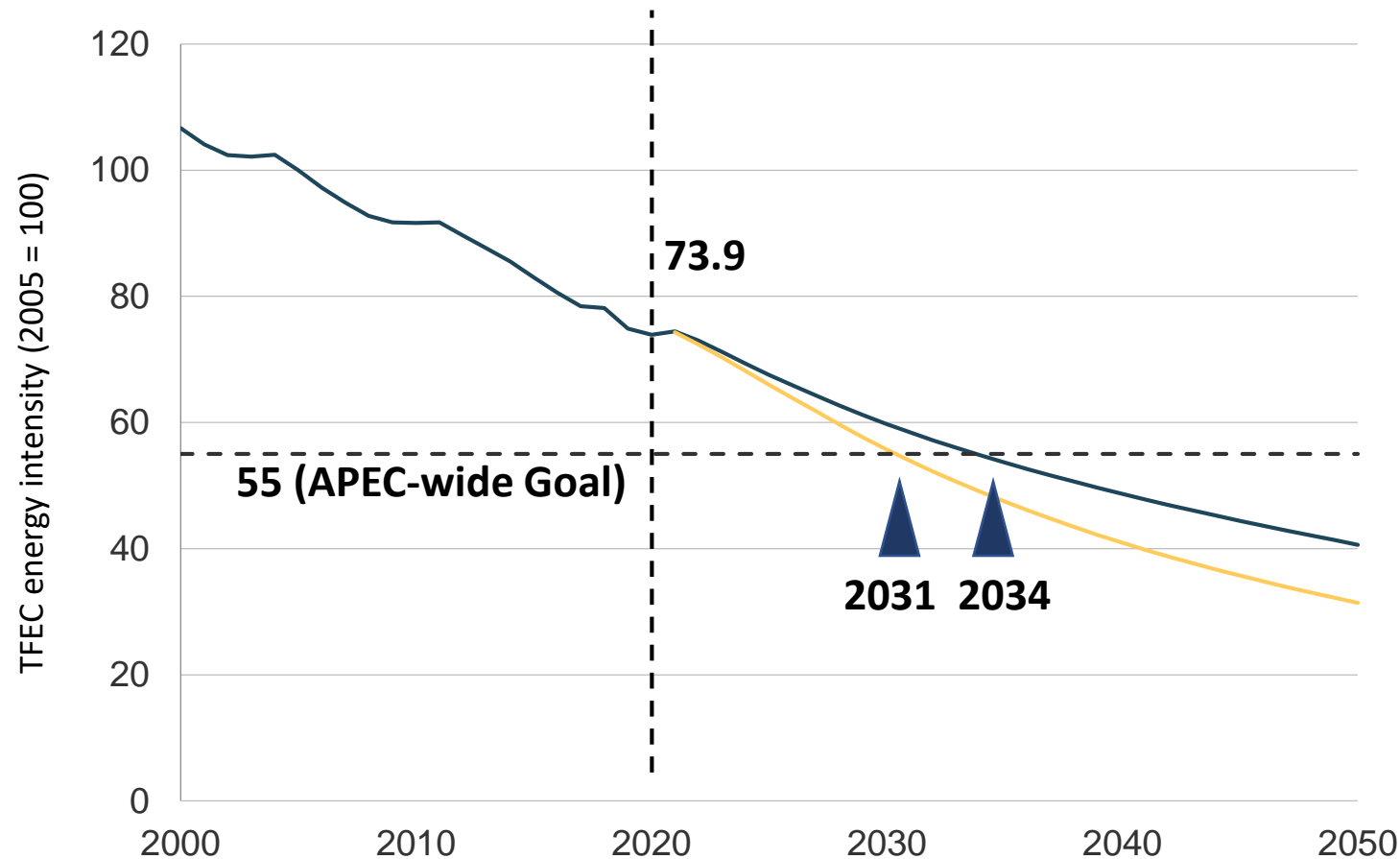
Contents

- 
- ▶  **Energy Intensity Progress & Projection**
 -  **Main contributors of EI reductions**
 -  **Primary drivers of EI reductions**
 -  **Examples of EI reductions**

Energy Intensity Progress & Projection

Current policies, measures, and trends are sufficient for the goal to be achieved

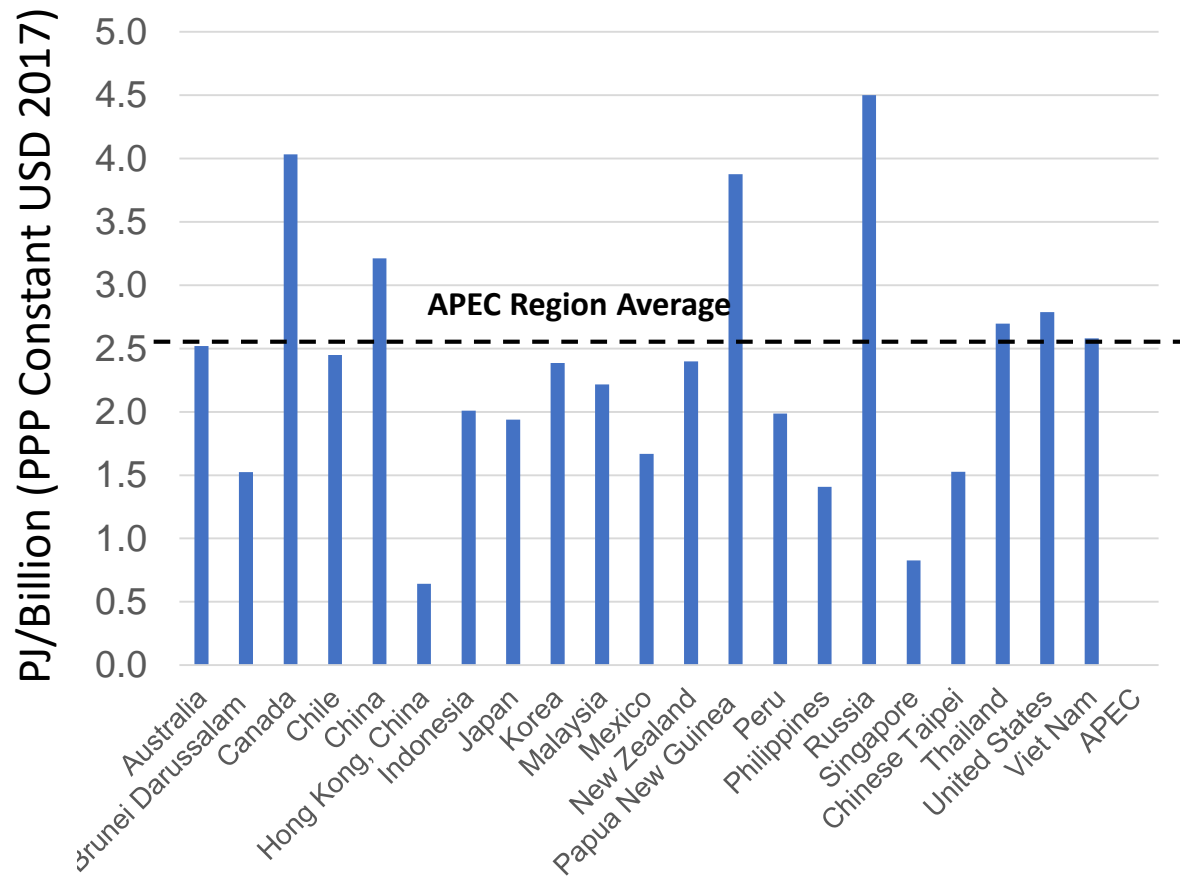
APEC Total Final Energy Consumption Intensity Index,
2000 to 2020 (2005 = 100)



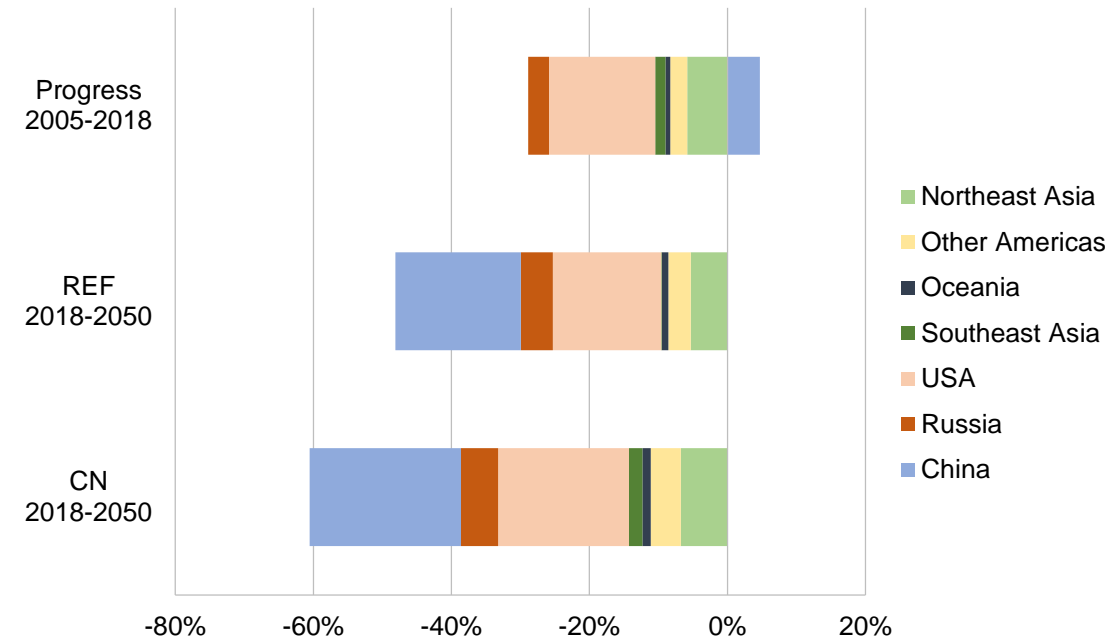
- ❖ Target: 45% by 2035 relative to 2005
- ❖ Latest progress: 26.1% reduced in 2020
- ❖ Projection: 45% in 2031 (CN)
45% in 2034 (REF)

Energy Intensity Progress & Projection by Region

APEC member economies Total Final Energy Consumption Intensity 2020



Historical and Projected Progress of APEC member economies on energy intensity



Source: APEC statistics (EGEDA), APERC analysis

- ❖ The most efficient: Hongkong China, Singapore
- ❖ Future APEC Energy Intensity reduction will highly depend on China and United States

Contents



 **Energy Intensity Progress & Projection**

▶  **Main contributors of EI reductions**

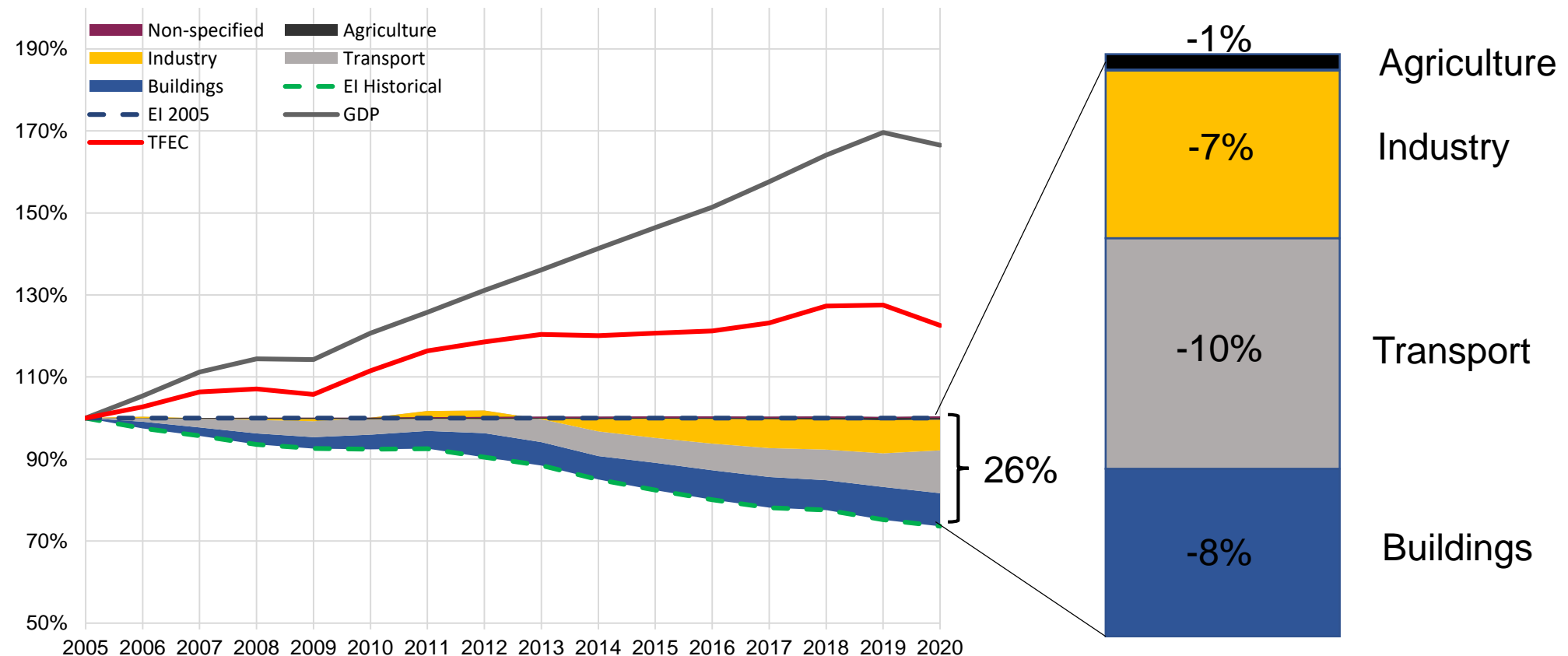
 **Primary drivers of EI reductions**

 **Examples of EI reductions**

Main contributors of EI reductions

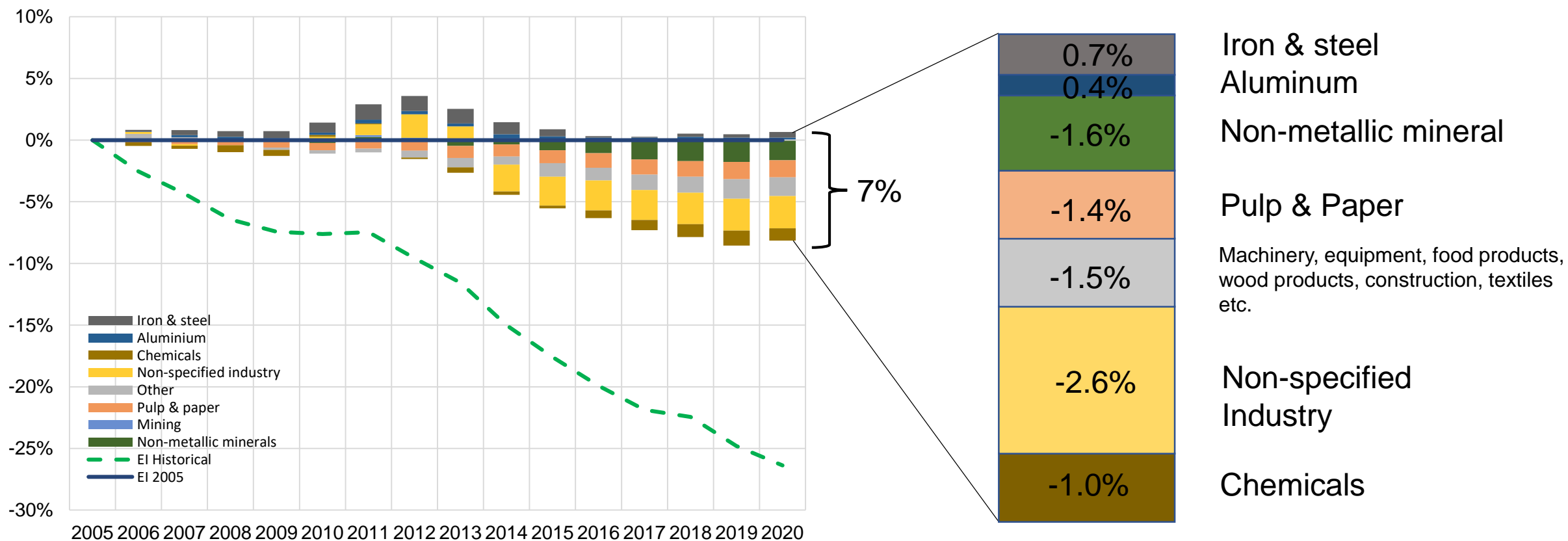
Transport, buildings and industry contributions are roughly equal on historical EI reduction

Energy Intensity in APEC region 2005-2020
(2005 = 100%)



Main contributors of EI reductions

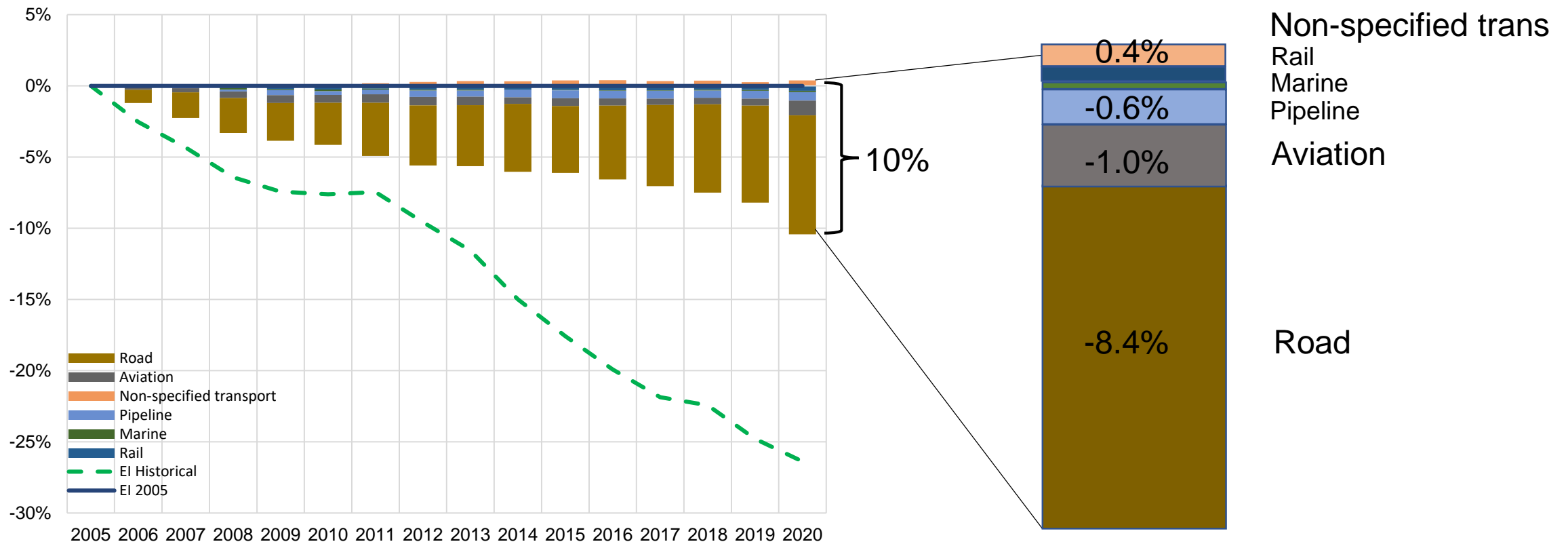
Industry Energy Intensity in APEC region 2005-2020 (2005 = 100%)



Main contributors of EI reductions

Road is the main contributor for historical Transport EI reduction

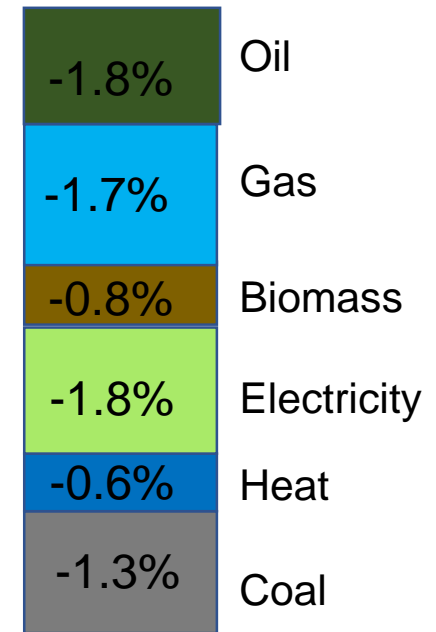
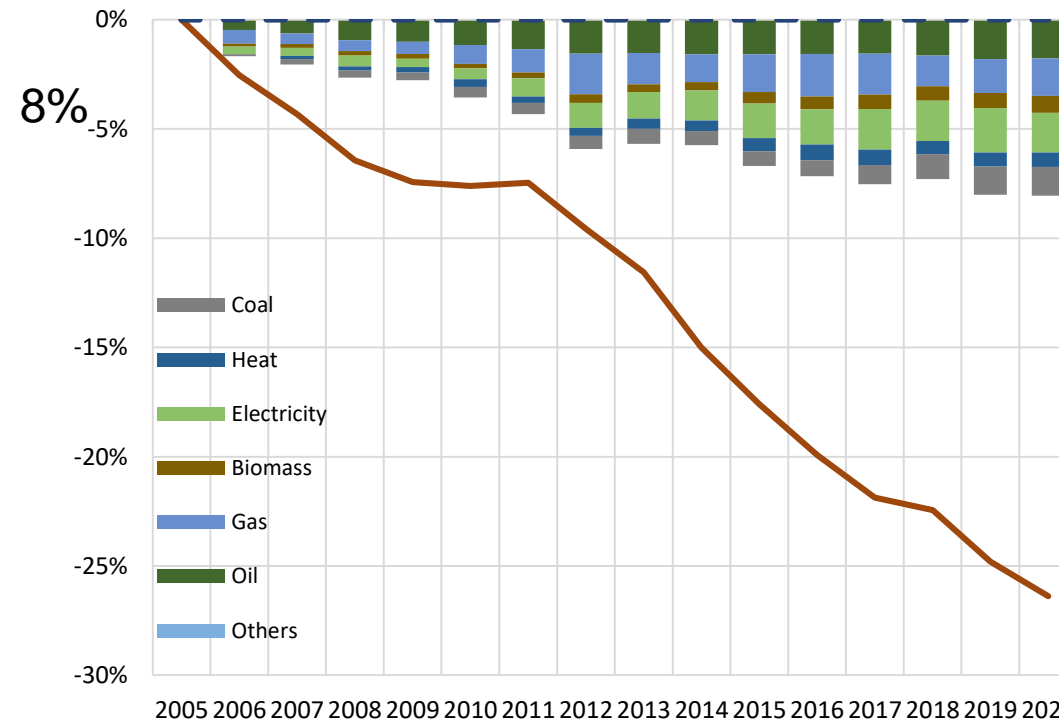
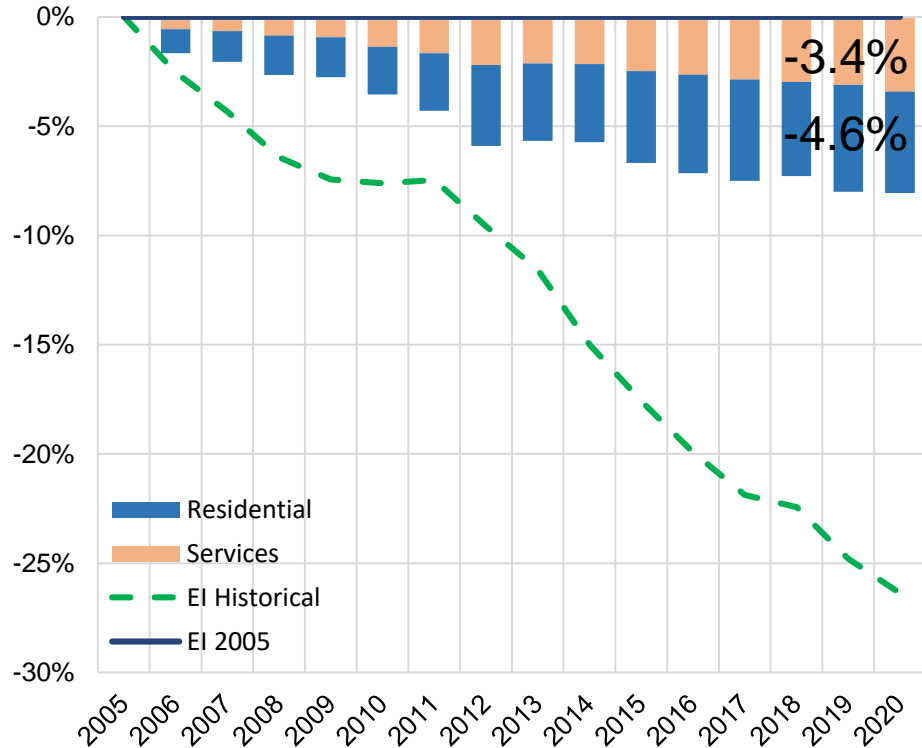
Transport Energy Intensity in APEC region 2005-2020
(2005 = 100%)



Main contributors of EI reductions

Coal, electricity, oil and gas were main contributors to historic EI reduction and roughly equal

Buildings Energy Intensity in APEC region 2005-2020 (2005 = 100%)



Contents



 **Energy Intensity Progress & Projection**

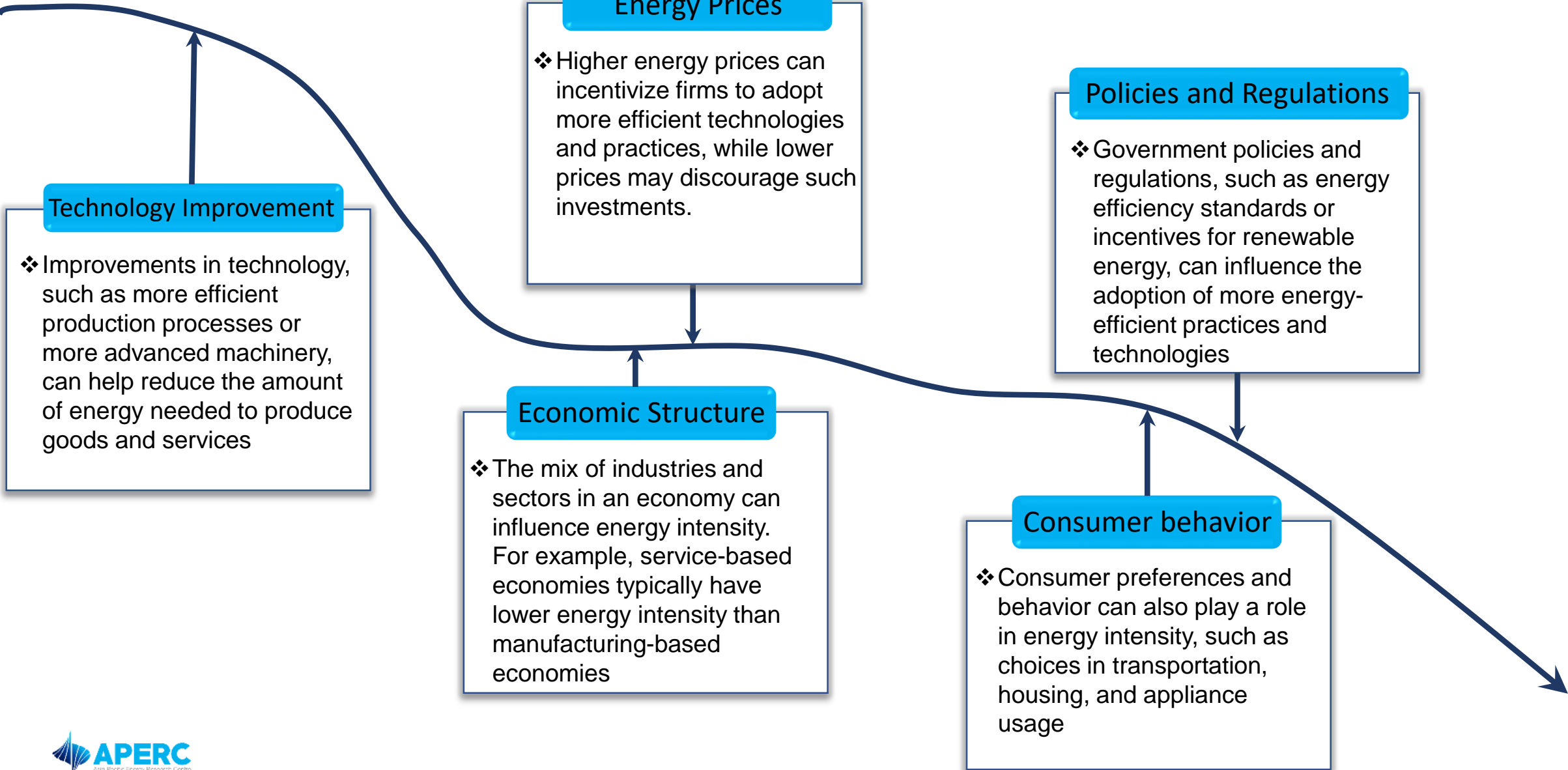
 **Main contributors of EI reductions**

  **Primary drivers of EI reductions**


 **Examples of EI reductions**

Primary Drivers of EI Reductions

Energy Intensity



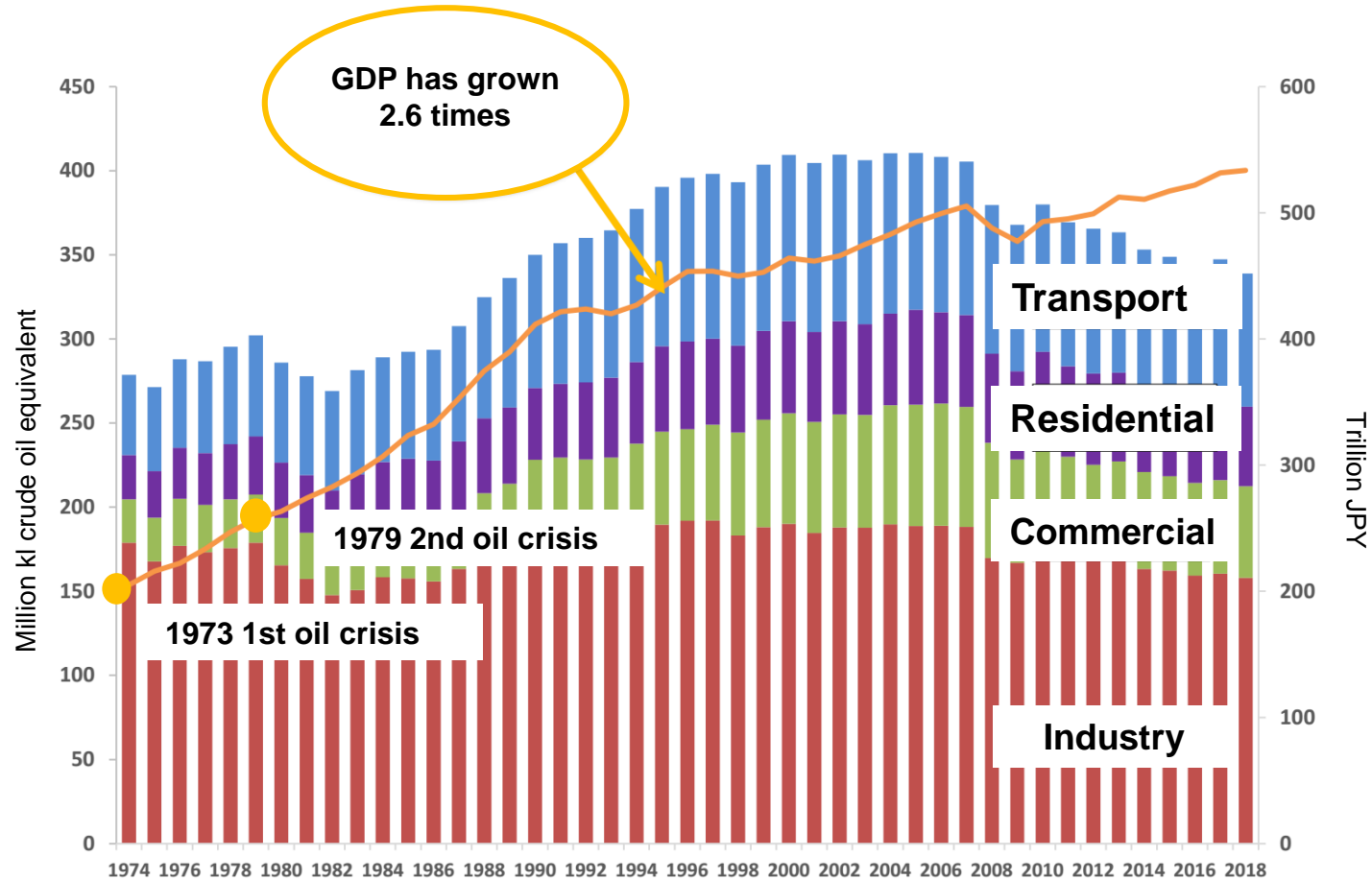
Contents

- 
- ⦿ **Energy Intensity Progress & Projection**
 - ⦿ **Main contributors of EI reductions**
 - ⦿ **Primary drivers of EI reductions**
 - ⦿ **Examples of EI reductions**

Examples of EI reduction (Japan's Energy Conservation Policy Framework)

Energy use grew more slowly than GDP in each sector

Total Energy Consumption of Japan 1974-2018



Total Energy Consumption	
Total	1973-2018 1.2 times
Transport	1973-2018 1.7 times
Residential	1973-2018 1.9 times
Commercial	1973-2018 2.1 times
Industry	1973-2018 0.8 times

Examples of EI reduction (Japan's Energy Conservation Policy Framework)

- Characteristics:**
1. Unified and strong determination of the whole society to reduce energy intensity
 2. Simultaneous implementation of regulations under the Energy Conservation Act and technical/economic subsidization measures
 3. Fined-tuned policy implementation for each sector
 4. Specific and definite standards to follow

	Industry	Commercial	Residential	Transport
Law & Regulations	Regular report, medium to long-term plans, 1% annual improvement in energy efficiency	Top runner system, performance labeling system		
		Building Energy Conservation Act expands the scope of obligation to comply energy conservation standards		Regular report, 1% annual improvement
	Benchmark			
Subsidization	Energy Saving Subsidy	Energy saving investment promotion business ZEN, ZEB, New-generation building material		New-generation friendly vehicle infrastructure subsidy
	Efficient transport			
	Energy-saving technologies and social application projects for the realization of a decarbonized society			
	Promoting energy optimal utilization business targeting small and medium-sized enterprises		Electronic Reporting System under the Energy Conservation Act, Global Warming Countermeasures Act etc.	
Advertisement for Energy Conservation				

Examples of EI reduction (Japan's Energy Conservation Policy Framework)

Regulatory Scheme at Manufacturing Plants, etc.

- ❖ Business operator with overall annual energy consumption (head office, manufacturing plants, sales offices, etc.) of at least 1,500 kl in crude oil equivalent are subject to regulations.
- ❖ Business modes, such as franchise chains of stores, are also considered single business operators and those consuming at least 1,500kl for the whole chain are subject to regulation.

Flow of Regulatory Action

- ❖ Obligation to report periodically
 - Transition of energy consumption
 - Status of activities relating to energy-conserving measures
 - Report annually on the status of benchmark indices (business subject to regulations only)



Source: Ministry of Economy, Trade and Industry of Japan

Examples of EI reduction (Japan's Energy Conservation Policy Framework)

Complete and effective policy system to improve the energy efficiency

Benchmark

- ❖ In addition to the existing targets (Reduction of annual average by 1%), extra energy conservation targets are set
- ❖ Benchmark was introduced in Manufacturing in 2009 before its scope has been enlarged to Service, IT, Commercials etc.

Example



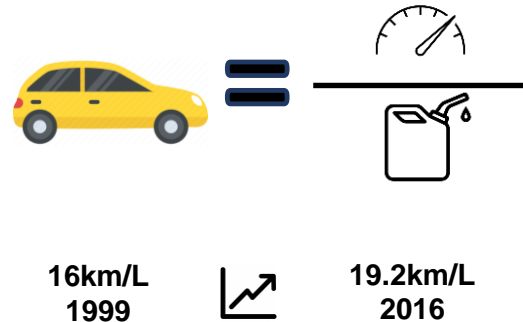
707kwh/Million JPY (Medium)
308 kwh/Million JPY (Small)

41.2% certified (2021 report)

Top Runner

- ❖ The top runner programme, introduced in 1999, is a set of energy efficiency standards for energy intensive products, such as home appliances and motor vehicles.
- ❖ Energy efficiency targets are set to be achieved within a given number of years on the basis of the most efficient model on the market (the 'Top Runner').
- ❖ Products which do meet the energy efficiency standard receive a Top Runner label at the point of sale

Example



SABC Evaluation

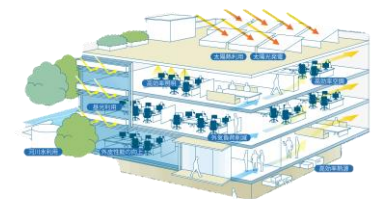
Those companies that are required to **report energy consumption/production** will be classified into 4 categories depending on their EE&C achievements.

- ❖ **S Class** (Companies with Superior EE&C).
 - ✓ Achievement of 1% annual energy intensity improvement or
 - ✓ Achievement of benchmark target
- ❖ **A Class** (Companies with Average EE&C)
 - ✓ Beyond B but below S
- ❖ **B Class** (Companies with Stagnant EE&C)
 - ✓ Non-achievement of annual energy intensity improvement target or
 - ✓ More than 5% energy intensity increase (5 years)
- ❖ **C Class** (Companies with poor EE&C)
 - ✓ Those companies with substantial non-compliance on the annual energy intensity improvement target

ZEH & ZEB

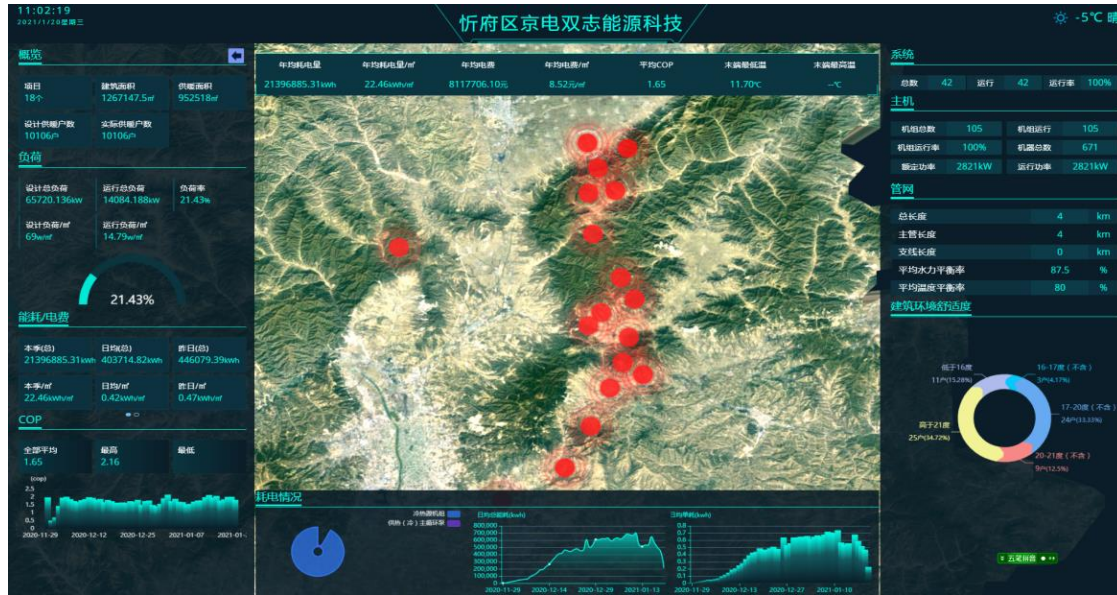
- ❖ "Zero Energy House" and "Net Zero Energy Building" refer to houses and buildings that aim for zero annual energy consumption by using renewable energy power while reducing conventional power consumption through the heat insulation effect of the building and energy-saving equipment

Example



Examples of EI reduction (Energy Efficiency Improvement Cases in China)

Case from China-- Collective Electronic Clean Heating



Data Gathering → Data Analysis → Physical Action

- ❖ COP(Coefficient Of Performance) of heating system increase from 1.7 to 2.2
- ❖ Cost of energy declines 1 usd/square meter per season



Examples of EI reduction (Energy Efficiency Improvement Cases in China)

Case from China—Smart Tobacco Heat-pump Baking



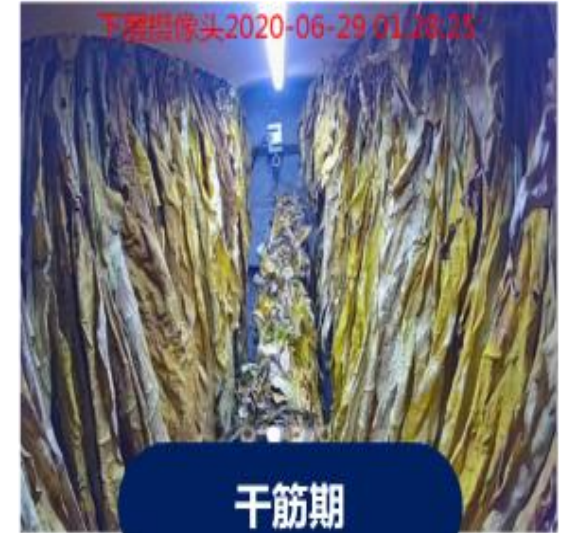
初始期



变黄期



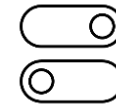
定色期



干筋期



AI



Data Gathering

Data Analysis

Physical Action

1. Traditional Coal-fire baking cost: 6.0 CNY/kg
2. Biomass-fire baking cost: 6.7 CNY/kg
3. Smart Heat-pump baking cost: 5.4 CNY/kg

Thank you.

<https://aperc.or.jp>

zhichao.li@aperc.or.jp

