



# Paving the Way for NDC Implementation: Analyzing Policy Options and Modeling Carbon Pricing Chile Case Study

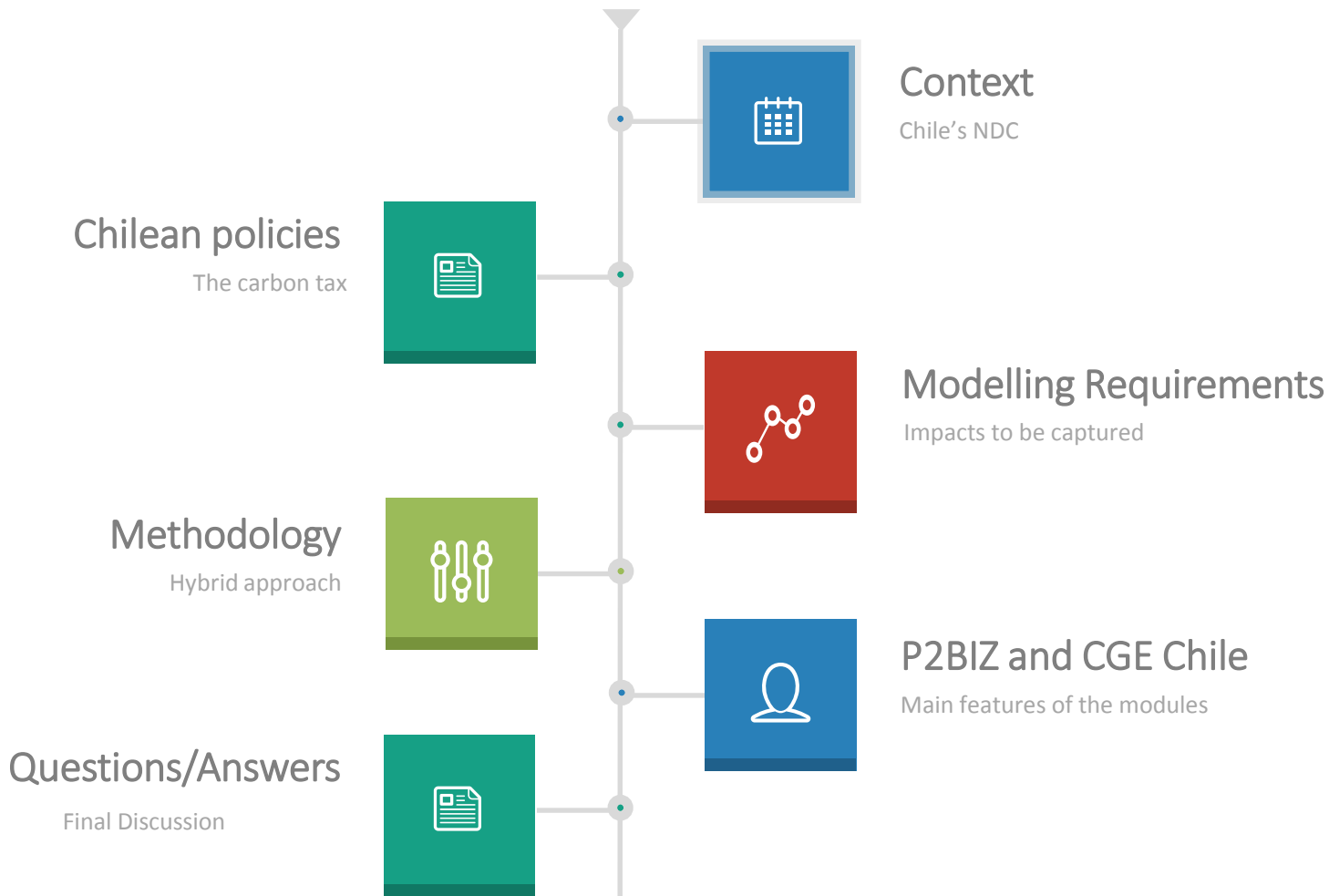
Jacques Clerc

7 December 2015



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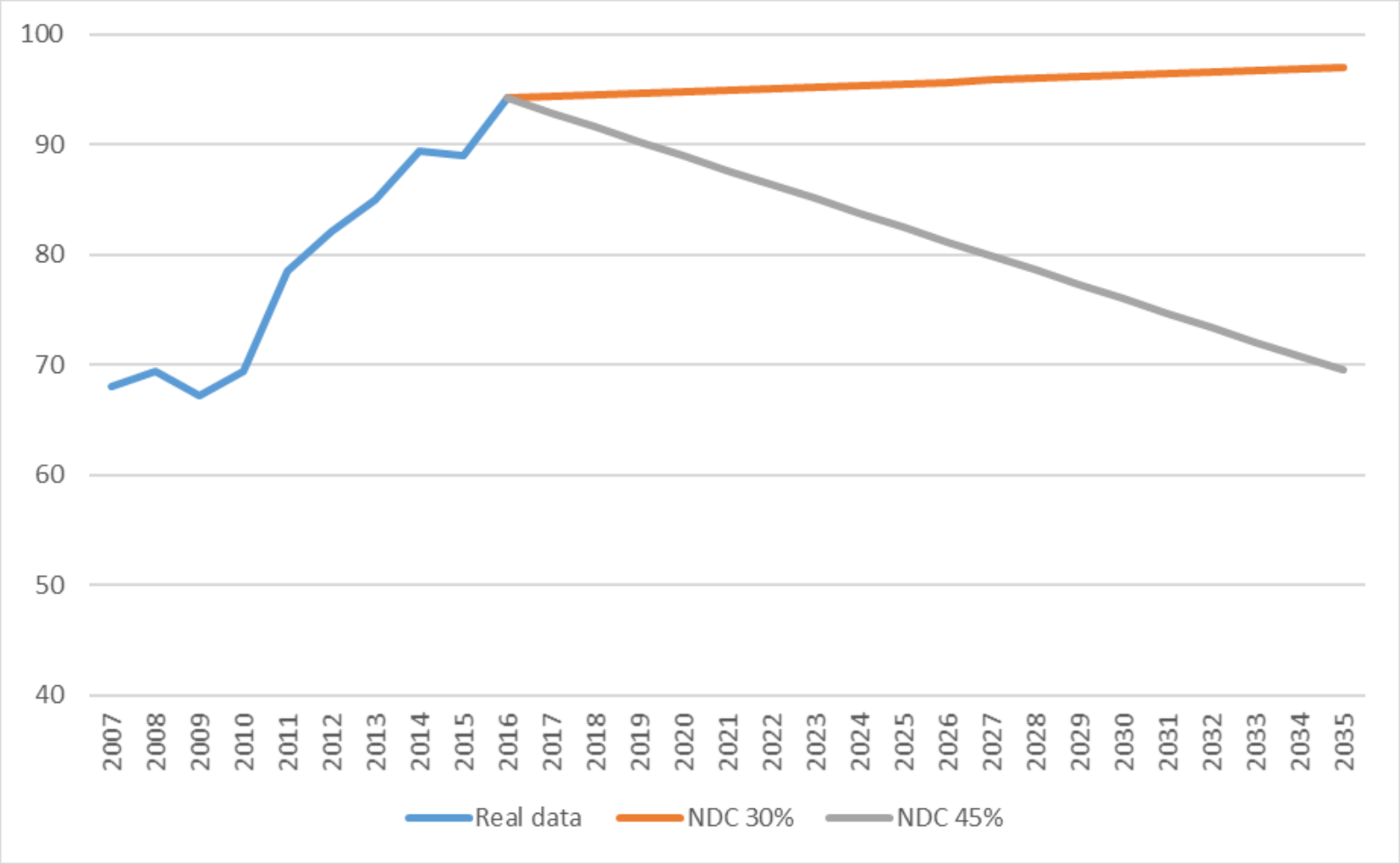
An overview of today's agenda



# Context: Chile's iNDC

- Committed to in Paris, December 2015 (COP21)
- Reduce GHG emissions intensity (tCO<sub>2</sub>e per unit of GDP in million CLP\$ 2011) by 30% by 2030 from 2007 level
- Target raised to 35-45% conditional on availability of international support
- applies to all sectors of the economy except LULUCF (separate absolute targets)

# Context: What does this targets mean?



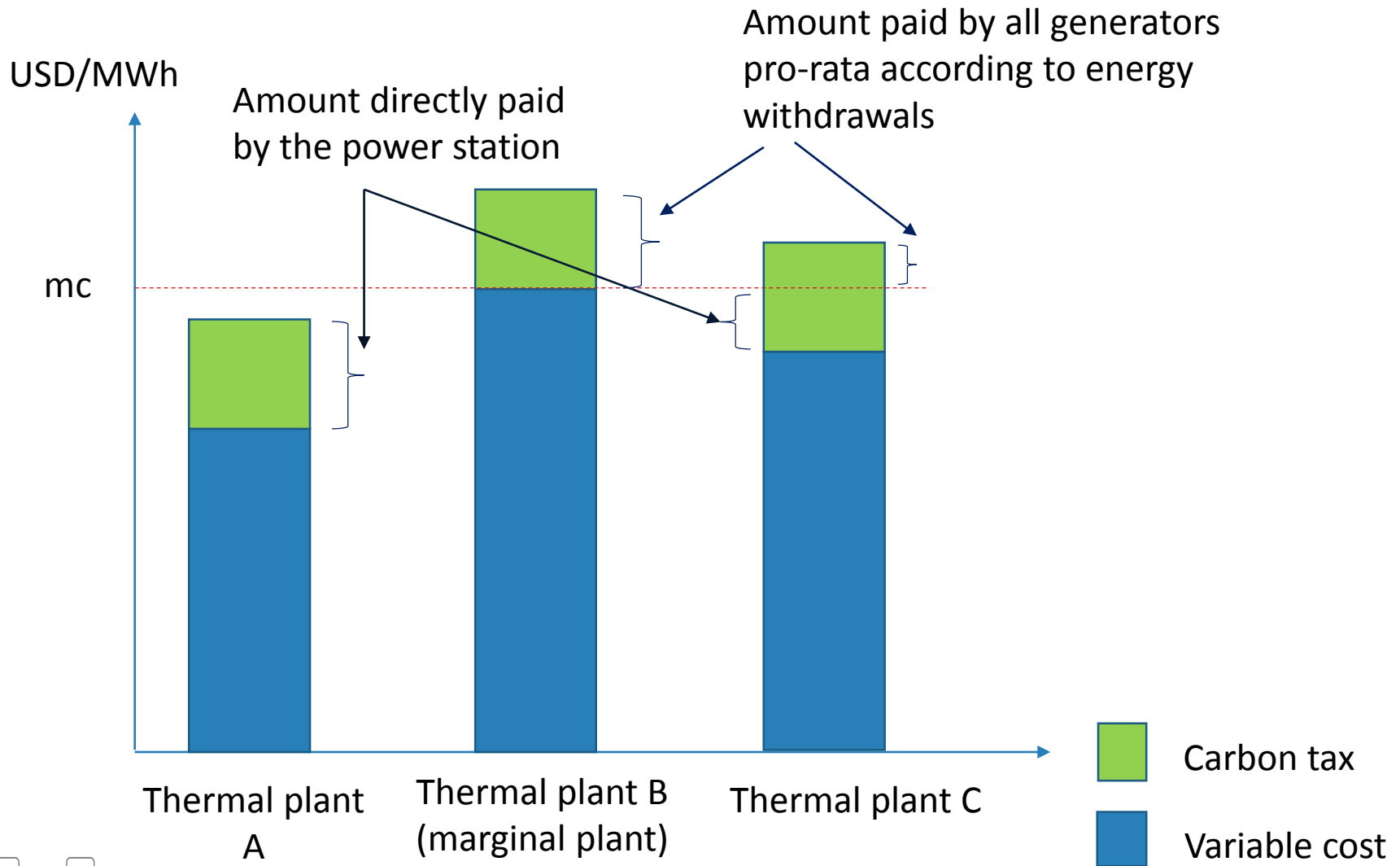
# Energy and mitigation policies

- Implemented/approved measures:
  - Non-Conventional Renewable Energy (NCRE) Law
  - Action Plan for Energy Efficiency 2020 (APEE20)
  - National Sustainable Construction Strategy
  - Tax on sale of lightweight vehicles
  - Carbon tax (USD 5/tCO<sub>2</sub> on power gen)
  - Net billing law
- The energy sector relies on current policies to meet its targets:
  - Energía 2050: energy roadmap (. e.g. 70% renewables by 2050)
  - Draft Energy Efficiency Law

# The Chilean Carbon Tax (1)

- Chilean carbon tax will be implemented in 2017
  - 5 US\$/MWh
  - Designed not to alter marginal costs
- Different studies have concluded its current level and design do not contribute to mitigation.
  - It does not modify dispatch in the short term
  - It does not modify LCOE estimates in the long term

# The Chilean Carbon Tax (2)



# Policy-oriented modelling

- Energy 2050 implementation plan:
  - Targets associated to instruments
    - Energy Efficiency law (decoupling mechanisms, auditing, standards)
    - Energy generation (auction mechanisms, transmission law, flexibility, ancillary services)
- Identify other complementary cost effective instruments: carbon pricing?
- Policy recommendations after 2030: carbon pricing?



# Methodology: hybrid approach (1)

## Modelling Strategy

Bottom-up  
Prospectiva E2BIZ

CGE Model

Very detailed  
technologica  
characterization

Robust economic  
foundations

# Methodology: hybrid approach

- Weak integration strategy: the hardest modelling challenge
- Base case calibration: Sector activity levels, energy consumption and emissions.
- Bottom-up results go into CGE: (capital costs and productivity gains: energy efficiency)
- Iterations: CGE results (changes in activity levels go back into bottom-up) model to assess changes in consumption and emissions.

# Overview of P-E2BIZ model

## Characteristics

### Bottom-up

- Final demand modelling with transformation sectors
- Consumption driven by relevant factors (copper, population)
- End-use and useful energy analysis

### Long-Term (2050)

- Designed to address long-term policy impact evaluation

### NEB consistency

- Sectorial and regional division, such as the NEB
- Main's input data for modelling comes from NEB

### Expert based

- Modelling includes market and trend analysis
- Expert opinion on future market/ technological conditions



# P-E2BIZ model

Main's modules and methodology

## HOUSEHOLDS PUBLIC BUILDINGS COMMERCIAL

Driver: Households

Useful energy analysis

Focus on heating



## TRANSPORT

Drivers: passenger or freight demand

Econometric and transport analysis



## INDUSTRY AND MINING

Drivers: Production levels or economic activity

Useful Energy Analysis: thermal, motor and electricity specific uses.



## POWER SECTOR

Optimal Dispatch and Expansion

Grid Interconnection modelling

Load duration and generation curves

CO2 tax modelling



# Overview of Chile CGE model

## Dynamic recursive

- Growth determined by savings
- Sector growth determined endogenously according to sector profits

## Closure rules

- Unemployment (mínimum wage)
- Balanced current account

## Top-down

- Modelling of agents that maximize welfare: firms, households, government.
- Quintiles of income

## Consistency with national accounts

2014 SAM



# Any Question ???

The Leader of the All business and personal presentation template ever

WHAT

WHY

WHERE

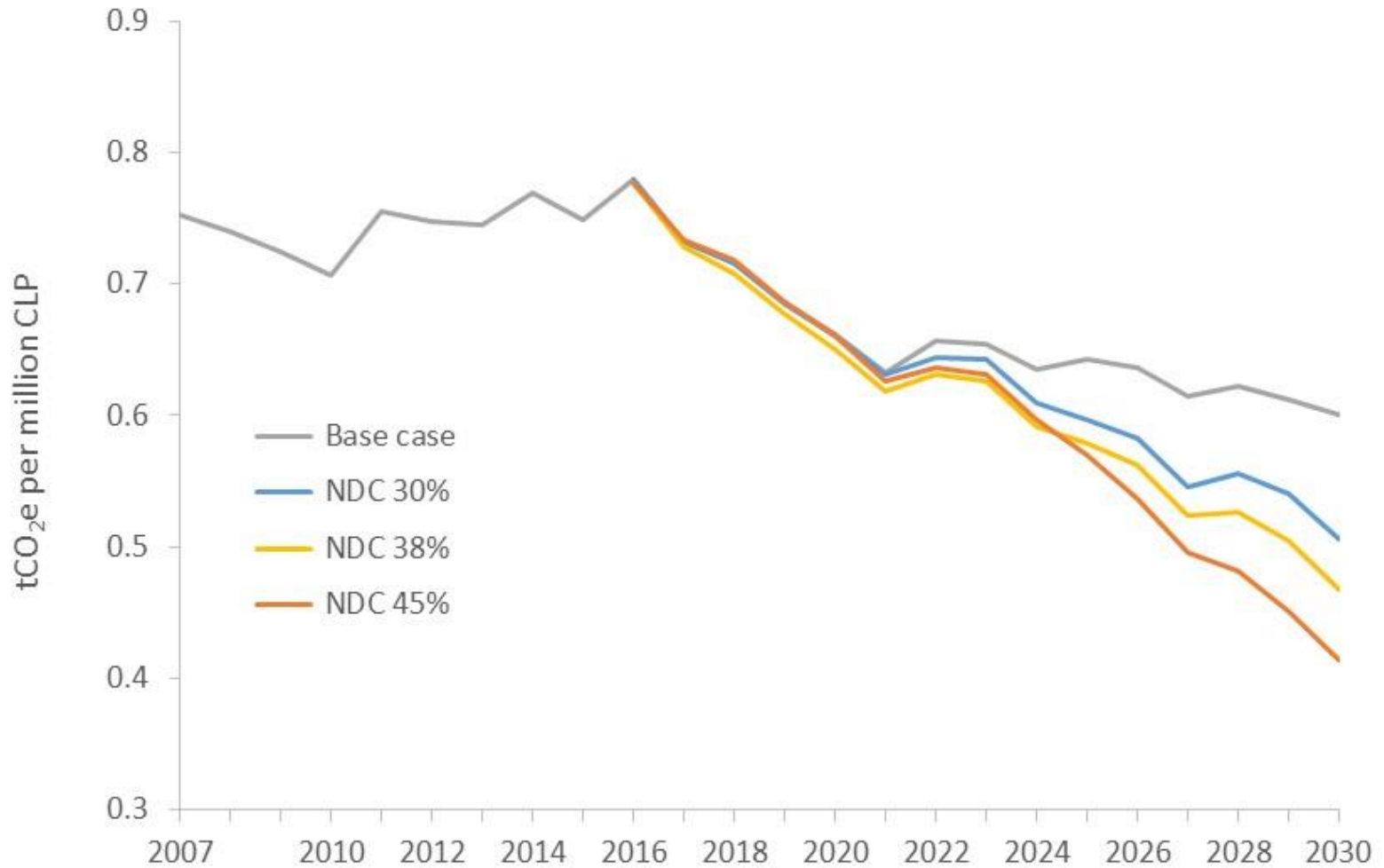
WHEN

WHO

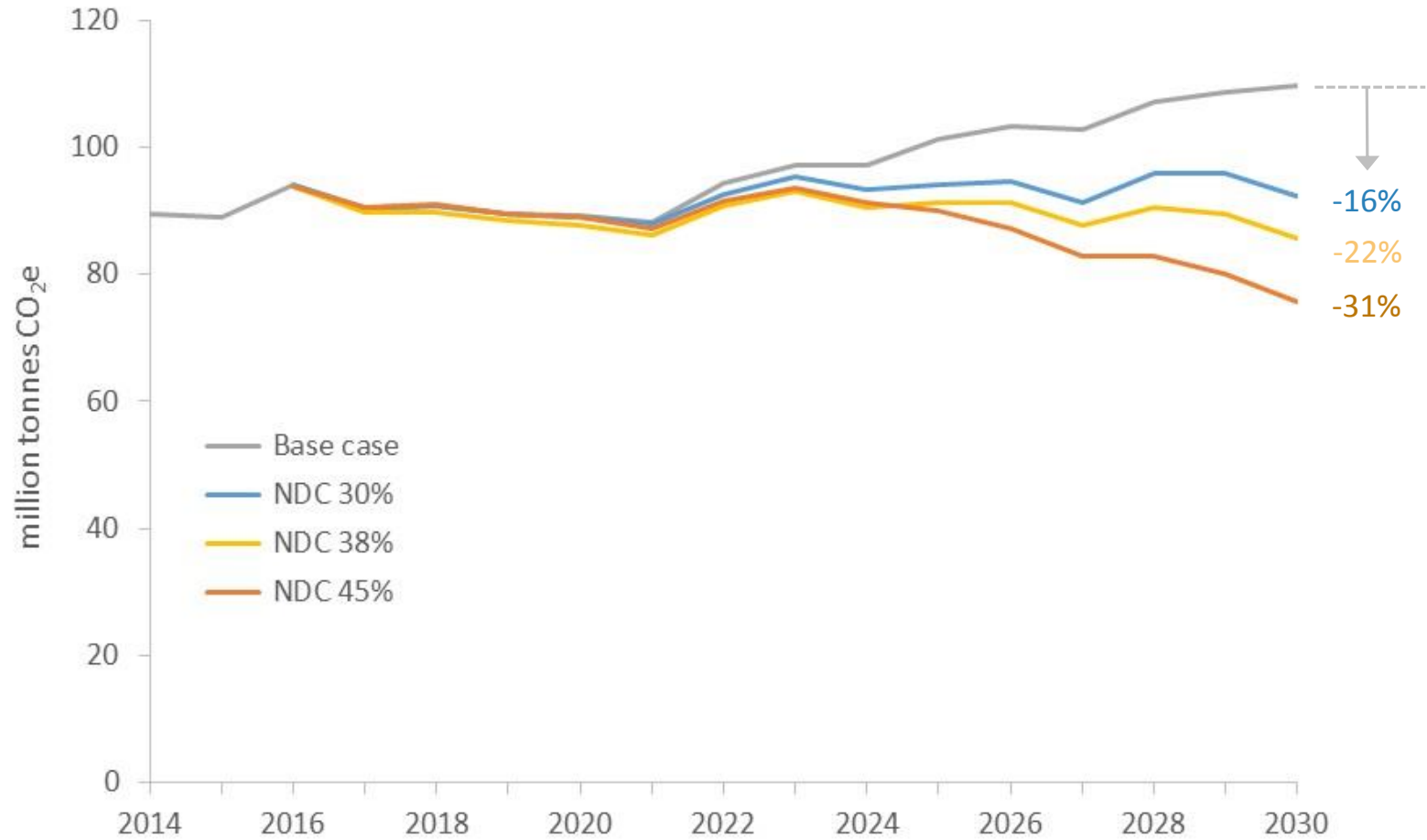
HOW



# Key results: GHG emissions intensity

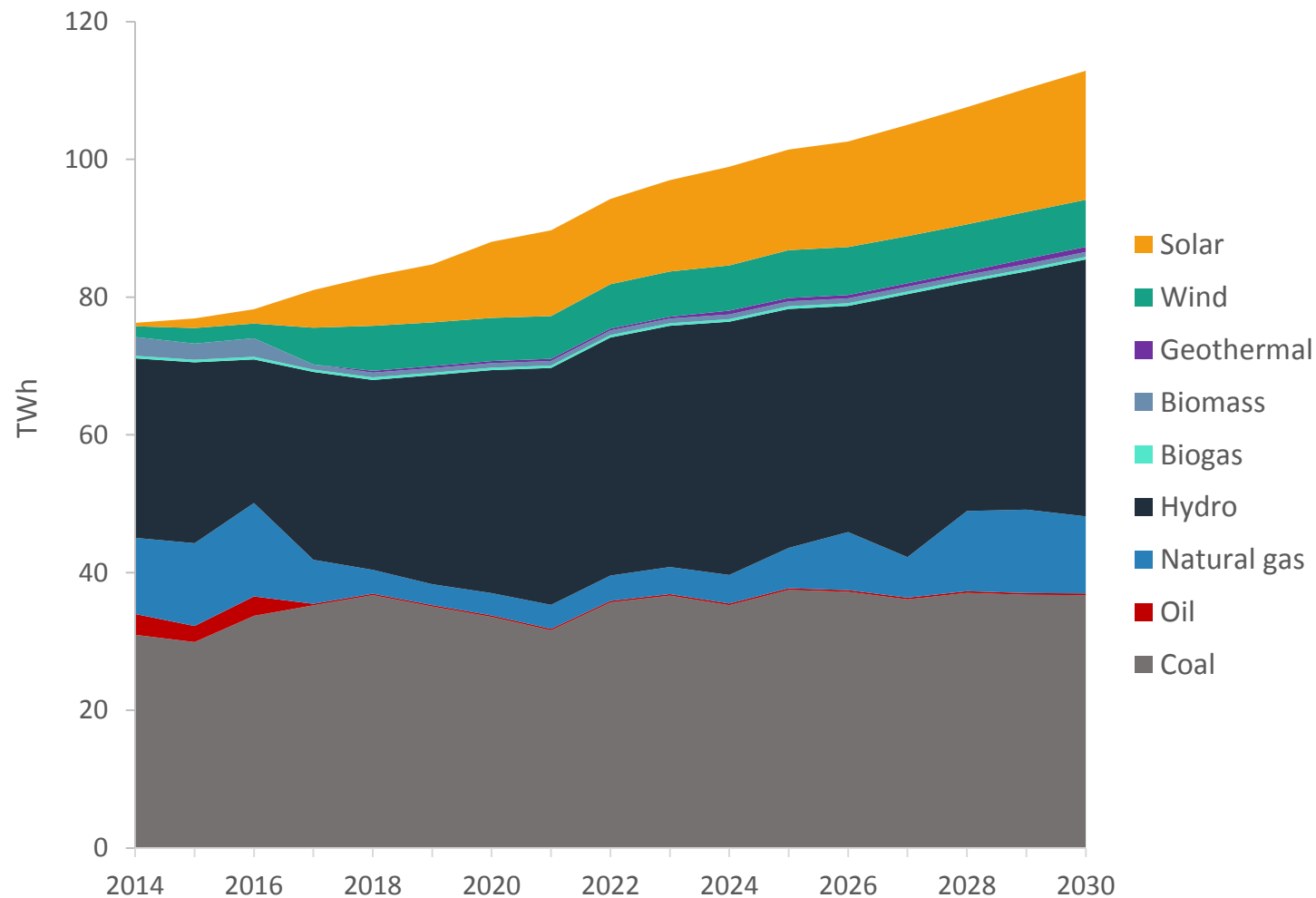


# Key results: absolute GHG emissions





# Key results: Base case generation



# Key results: Base case GHG forecast

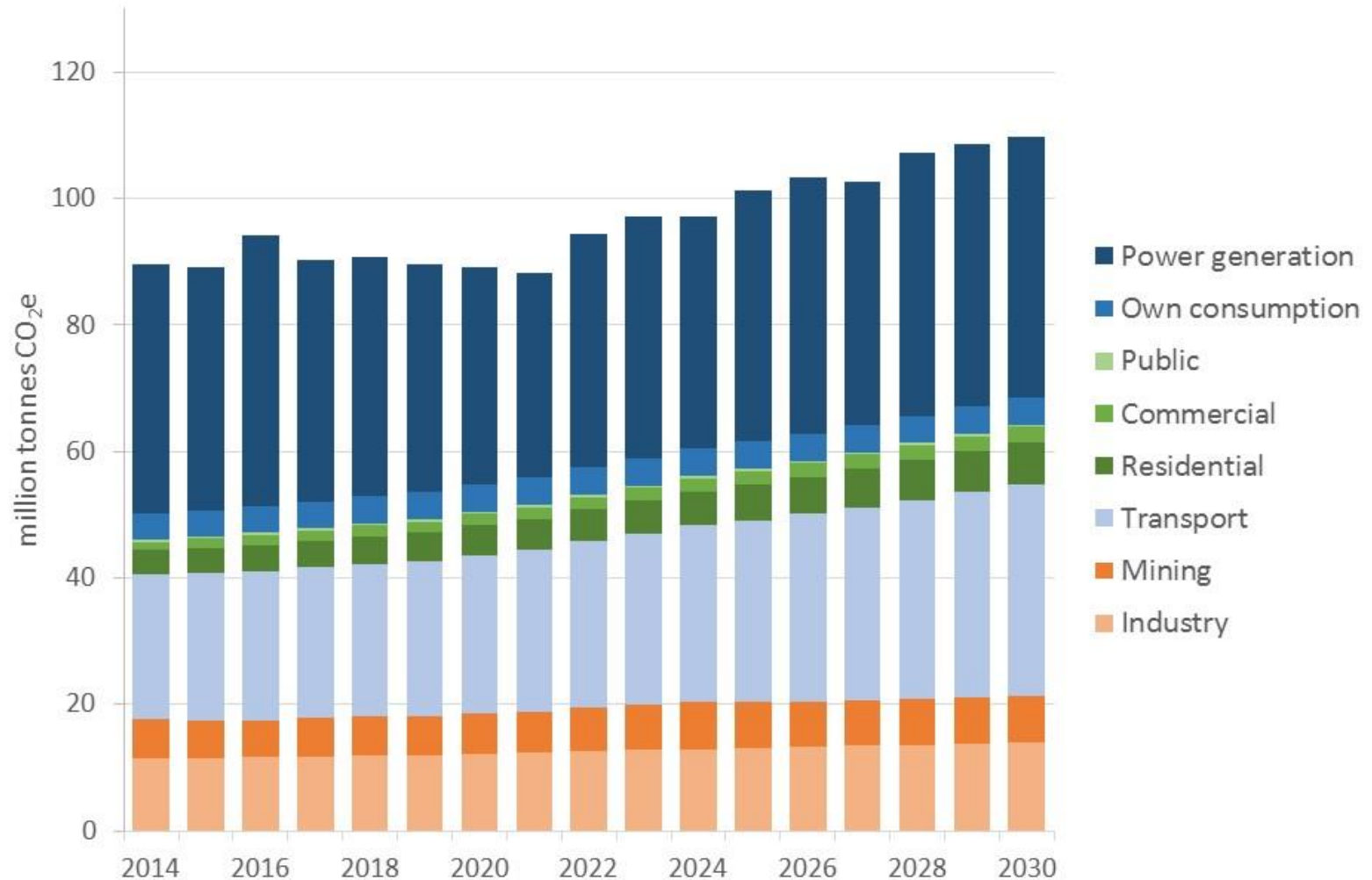
Emissions growth 2014-2030:

Power generation: 4%

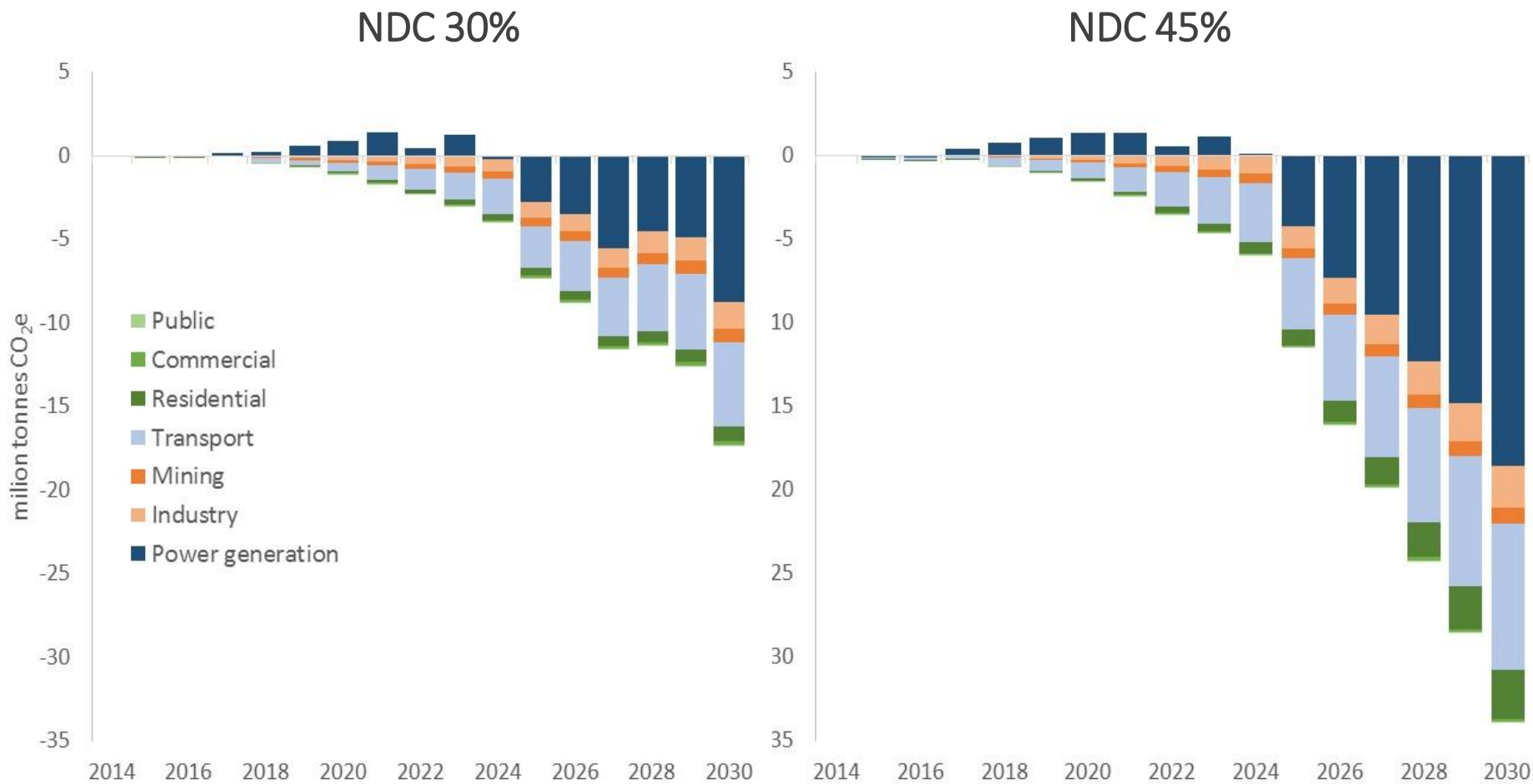
Transport: 45%

Industry & Mining: 21%

CPR: 79%



# Key results: GHG abated below base case



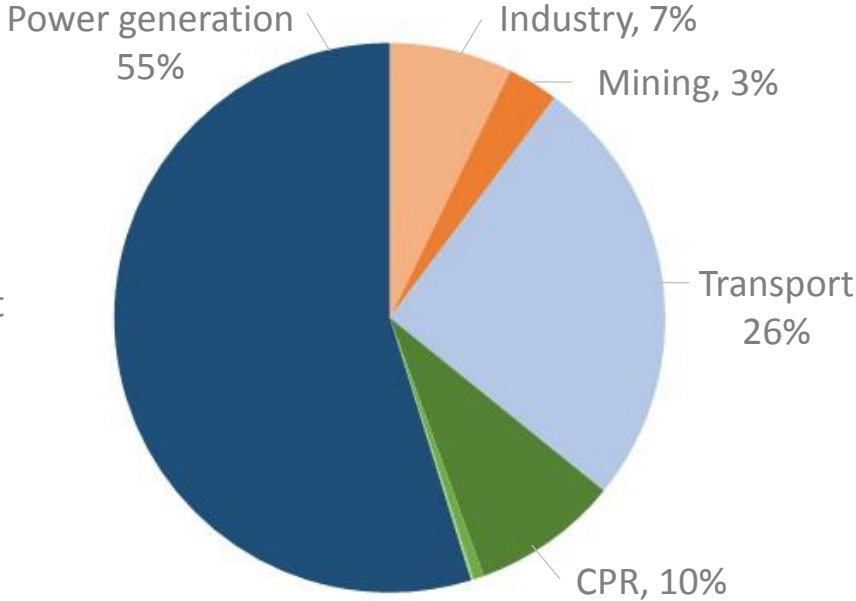
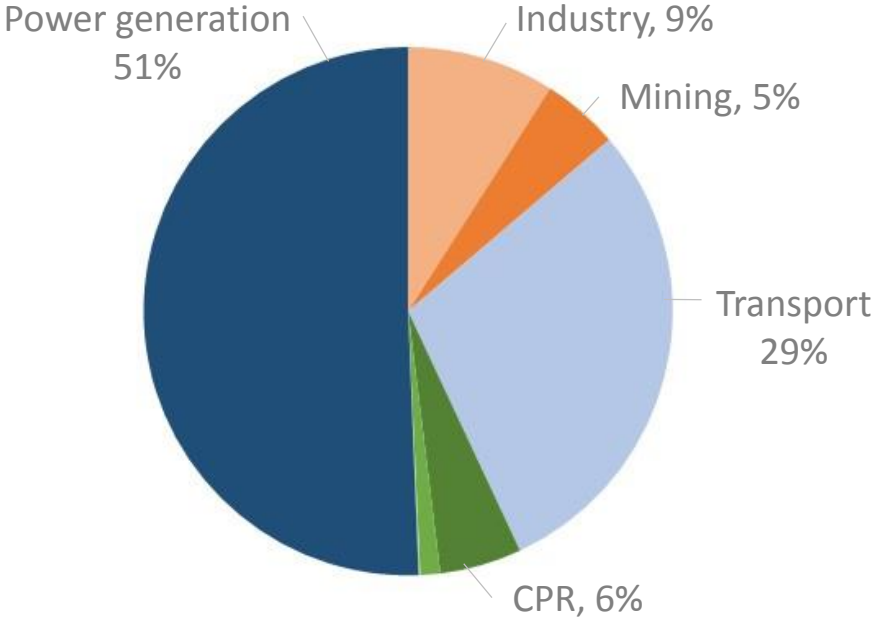
Total abated: 17.3 MtCO<sub>2</sub>e

Total abated: 34.0 MtCO<sub>2</sub>e

# Key results: GHG abated in 2030

NDC 30%

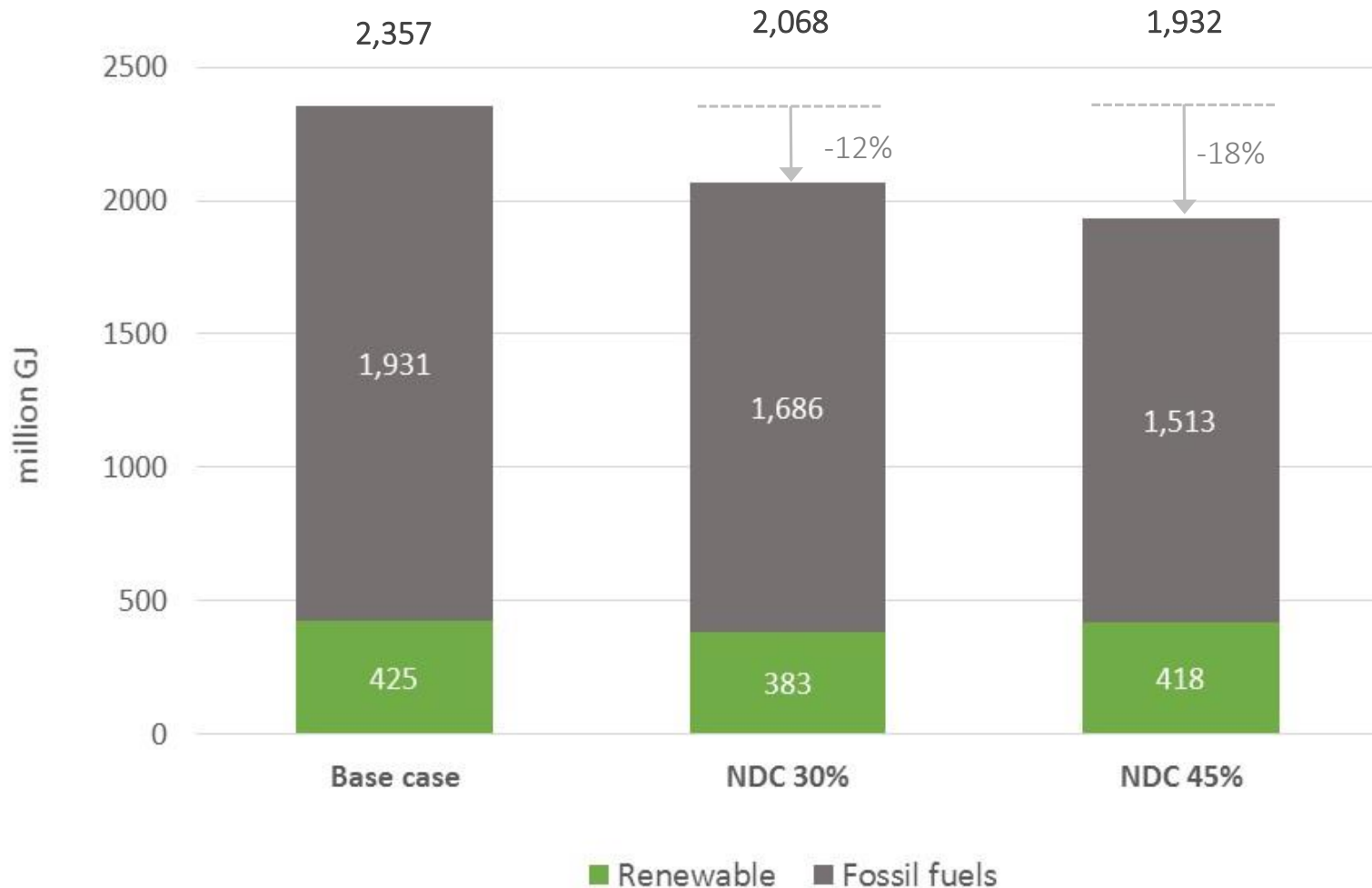
NDC 45%



Total abated: 17.3 MtCO<sub>2</sub>e

Total abated: 34.0 MtCO<sub>2</sub>e

# Key results: Total Primary Energy Supply





# Energy to Business

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