# Assessment of Low-Carbon Technologies for the Chinese Urban Residential Sector

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## Introduction

The economy of China has developed rapidly

Demand for higher living standards and energy consumption

#### System Analysis -

- Bottom-up modelization of household energy system
- Energy efficiency scenarios through 2050

Technology evaluations on energy efficiency of Chinese urban households

### Methods

Part 1. Modelization of household energy system

#### Part 3. Technology options for efficiency scenarios

- Each existing technology is grouped with one *NEW* technology and one *BAT* (best available) technology
- *AIM-Enduse* model gives the best technology combination of cost-benefit performance based on optimization analysis

**Technology list (partial):** 

	Initial Investment Cost	Payback Time
Thermal retrofitting	30,100 USD per toe	30 years
High-efficiency air-conditioner	17,300 USD per toe	15 years
High-efficiency Water heater (NG)	16,400 USD per toe	15 years
Electric range	32,000 USD per toe	15 years

#### **Bottom-up Analysis Flowchart**



#### Part 2. Model calibration

- Model estimates constantly appear to be larger than statistics
- In China the demand has not been fully satisfied due to limited financial resources
- "Satisfaction factor" is introduced to relate energy consumption pattern to economic level

#### **Satisfaction Factor**







#### Marginal abatement cost curve (countermeasure scenario, 2030)





#### $SF_i = 100\%$ (*GDPPC*<sub>i</sub> $\ge 17,034$ intl.\$)

*GDPPC*<sub>i</sub> is GDP per capita (PPP, intl. \$, 2000), *a* is a constant resulted from optimization analysis \*17,034intl.\$: The lowest GDP per capita (Turkey) in OECD countries (*stats.oecd.org*)



Reduction quantity (MtCO<sub>2</sub>eq)

(HEL=Heilongjiang, BEI=Beijing, SHH=Shanghai, GUD=Guangdong; results of totally 31 regions are available)

- The efficiency technologies bring CO<sub>2</sub> emission reduction in countermeasure scenario
- Emission reduction could be achieved with gain of financial profits (negative abatement cost)

### **Further Work**

More accurate service demand prediction

Rural residential area, other sectors