3-2. Building (Residential and Commercial) Sector Demand

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I. Building sector overview

II. Building model methodology

III. Preliminary results (BAU scenario)
I. Building sector overview
APEC final energy demand in 2015

- Building sector is the third largest energy consuming sector.
- Demand in residential buildings was about twice that in services.

Source: IEA 2017
II. Building model methodology
Building model - a small part of the big picture

APERC’s energy demand and supply model structure

Key Assumptions:
- GDP
- Population
- Prices
- Constraints

Transport Model:
- International
- Domestic
- Air
- Sea
- Rail
- Road
- Pipe

Industry Model:
- ALM
- CEM
- I&S
- P&P
- MINE
- NE
- NS
- OTH

Residential Buildings Model:
- App
- Cook
- Light
- Oth
- Space
- Cool
- Water Heat

Services Buildings Model:
- Light
- Oth
- Space
- Space Cool
- Water Heat

Agriculture & Non-Spec Model:
- Agriculture
- Non-Specified

Hydrogen Sub-Model:
- Supply
- Demand

Refineries Model:
- Oil Refinery
- Biorefinery
- Bioenergy Supply Potential

Electricity Model:
- Coal
- Oil
- Gas
- Nuc
- Ren
- CHP
- CCS
- TD

Heat-Only Plants Model:
- Heating
- Cooling

Other Transformation Sub-Model:
- Energy Industry Own-Use

Supply Model:
- Production
- Trade
- Coal
- Oil
- Gas
- Nuc

Integration:
- CO₂ Emissions
- Investment Totals
- Balances
- Energy Savings

Source: APERC
Modelling residential demand - key steps

Legend
- Input parameter
- Intermediate parameter
- Data Output

Source: APERC
Modelling service demand - key steps

Population

GDP

Climate

Service floor area

Technology

Enduse demand

Legend

- Input parameter
- Intermediate parameter
- Data Output

Source: APERC
III. Preliminary results (BAU scenario)
Demand growth varies with regions

APEC demand for all buildings, 2000 - 2050

- USA and China have the largest combined share, around 60%, throughout the projection period.
- South-East Asia is the fastest growing region. Demand grows by 56% due to high GDP and population growth.

Source: IEA 2017, APERC analysis
Electricity remains the major fuel

APEC building demand by fuel type, 2000 - 2050

- Electricity, gas and heat increase in share because of urbanisation, electrification and development.
- Renewables (mainly biomass), coal and oil decrease in share.

Source: IEA 2017, APERC analysis
• **Electricity and gas are the major fuel types in all buildings.**
• **Share of electricity grows faster in residential buildings than in service buildings.**
• **Use of biomass decline in residential buildings.**
• **Renewables are not major fuel types in service buildings.**
Space heating - major enduse in residential buildings

APEC residential building demand by enduse, 2000 - 2050

- Over 50% of energy is consumed by space heating and water heating.
- Space heating, cooking and lighting decline in share, while space cooling and appliances increase in share.
Other enduse - major enduse in service buildings

APEC service building demand by enduse, 2000 - 2050

- Other enduse (e.g. elevators, office equipment) grows, consuming over 50% of total demand by 2050 compared with 47% in 2015.
- Space heating and lighting decline in share (consistent with residential buildings), while other enduse and water heating increase in share.

Source: IEA 2017, APERC analysis
Policies and technology cause energy intensity to fall

APEC energy intensity in buildings, 2015 – 2050

- **Demand increases at slower rate than households.**
- **Energy intensity declines by 8%.**
- **Demand increases at slower rate than floor area.**
- **Energy intensity declines by 21%.**

Source: IEA 2017, APERC analysis
Energy intensity of GDP declines even faster

APEC energy intensity in all buildings, 2015 - 2050

- **GDP increases at a faster rate than households or service floor area.**
- **Energy intensity of GDP declines faster, by 58% by 2050.**

Source: IEA 2017, APERC analysis
Buildings represent 24% of energy demand in 2050

APEC final energy demand in 2050

- Building demand is not growing as fast as other sectors.
- Share of demand by buildings declines from 26% in 2015 to 24%.
- Demand by service buildings grow faster than residential buildings.

Source: APERC analysis
Preliminary conclusions and future work

• Building demand is projected to grow, driven by GDP and population.
• Energy intensity falls in the BAU scenario.
• Electricity remains the major fuel.
• Future work includes:
  ✓ More detailed breakdown of enduses;
  ✓ Refine technology improvement rate at economy level;
  ✓ Model the effect of changes in commercial activities; and
  ✓ Model the effect of shifting of population in major economies.
Thank you for your kind attention

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