



**ESCWA**  
UNITED NATIONS ECONOMIC & SOCIAL  
COMMISSION FOR WESTERN ASIA

# Buildings sector: Energy Productivity in the GCC

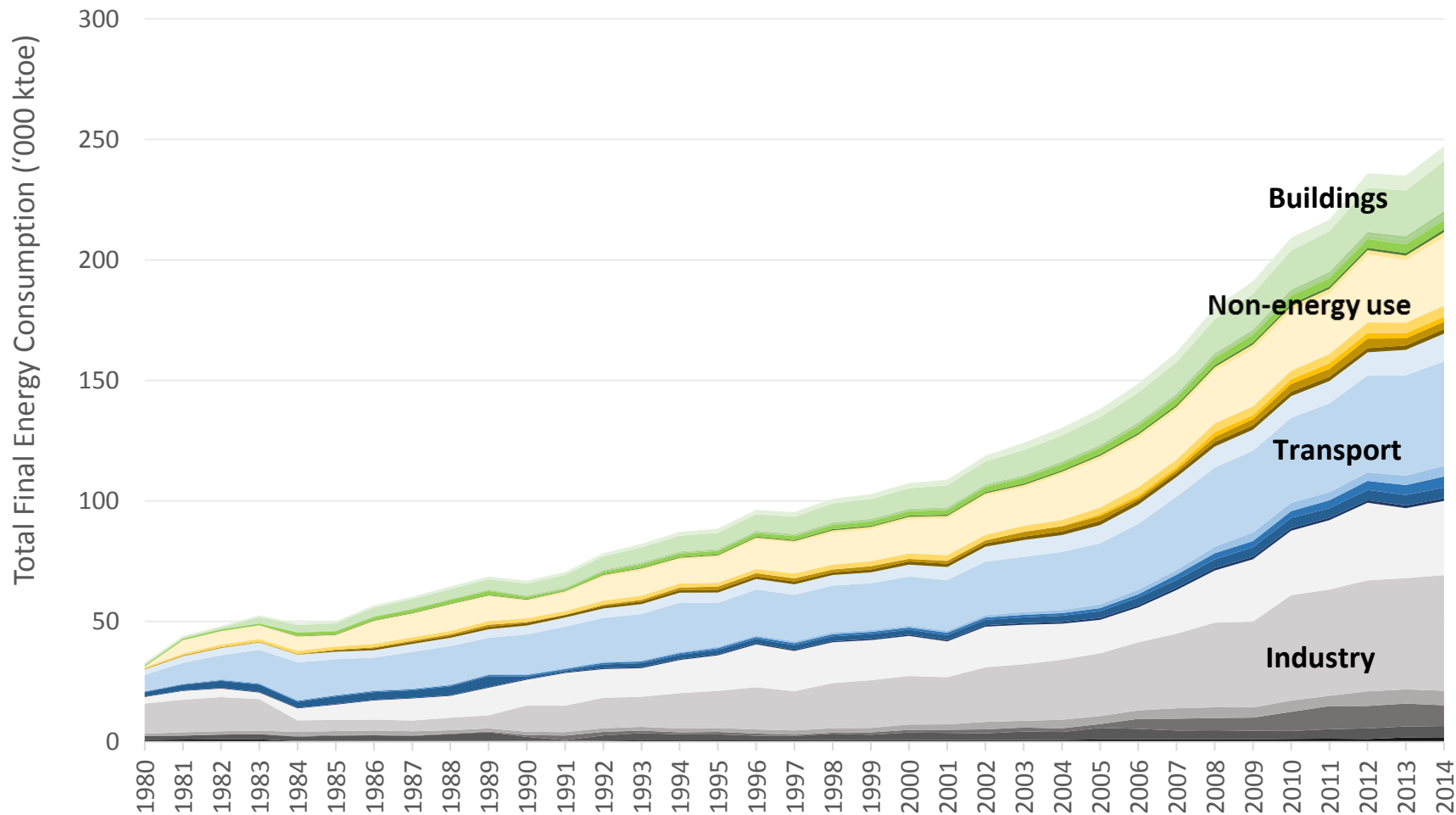
Kankana Dubey

**KAPSARC**

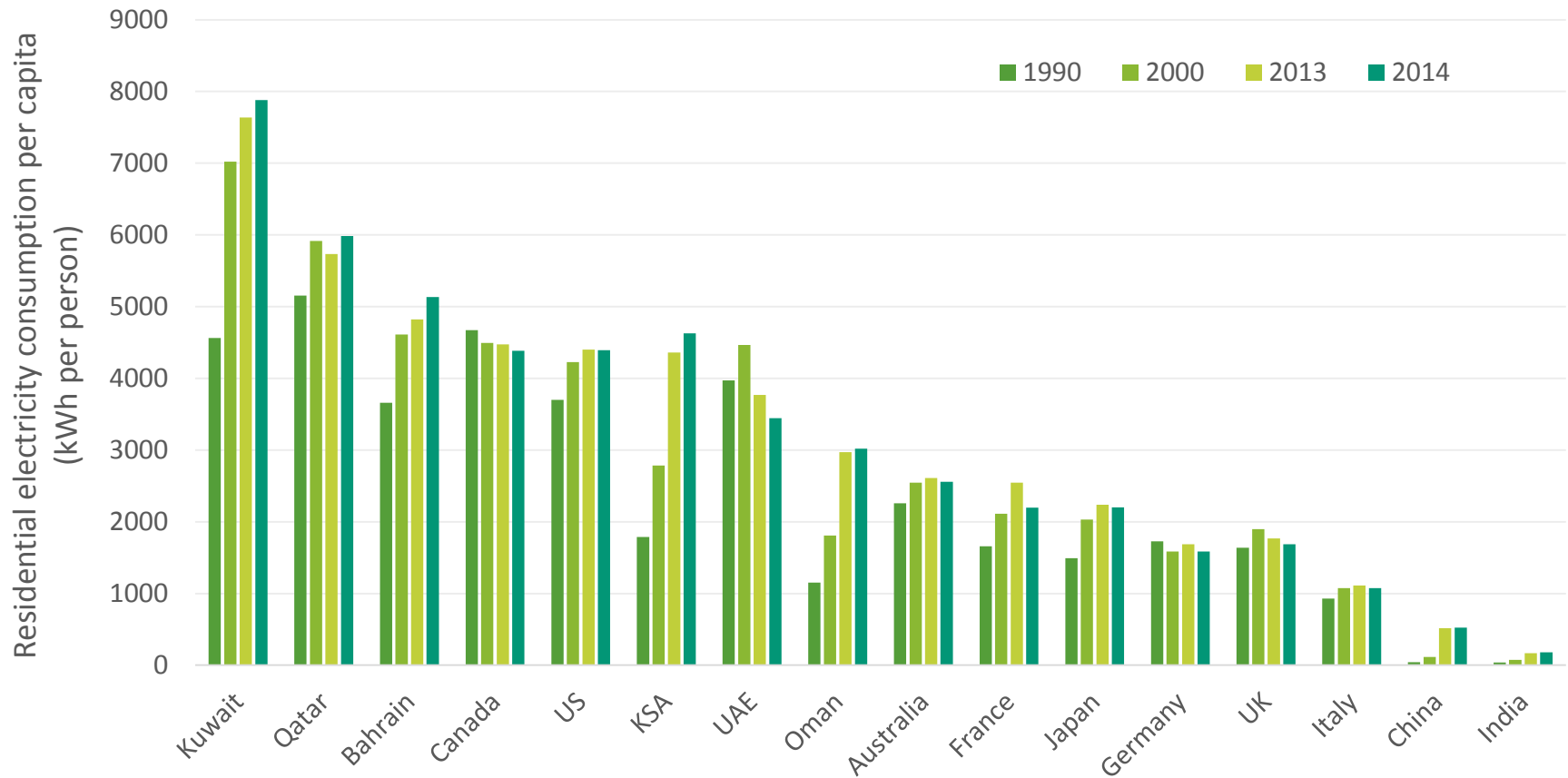
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7<sup>th</sup> International Forum on energy for Sustainable Development in Baku, 18 October 2016

# Are GCC countries getting the most value out of their energy consumption?

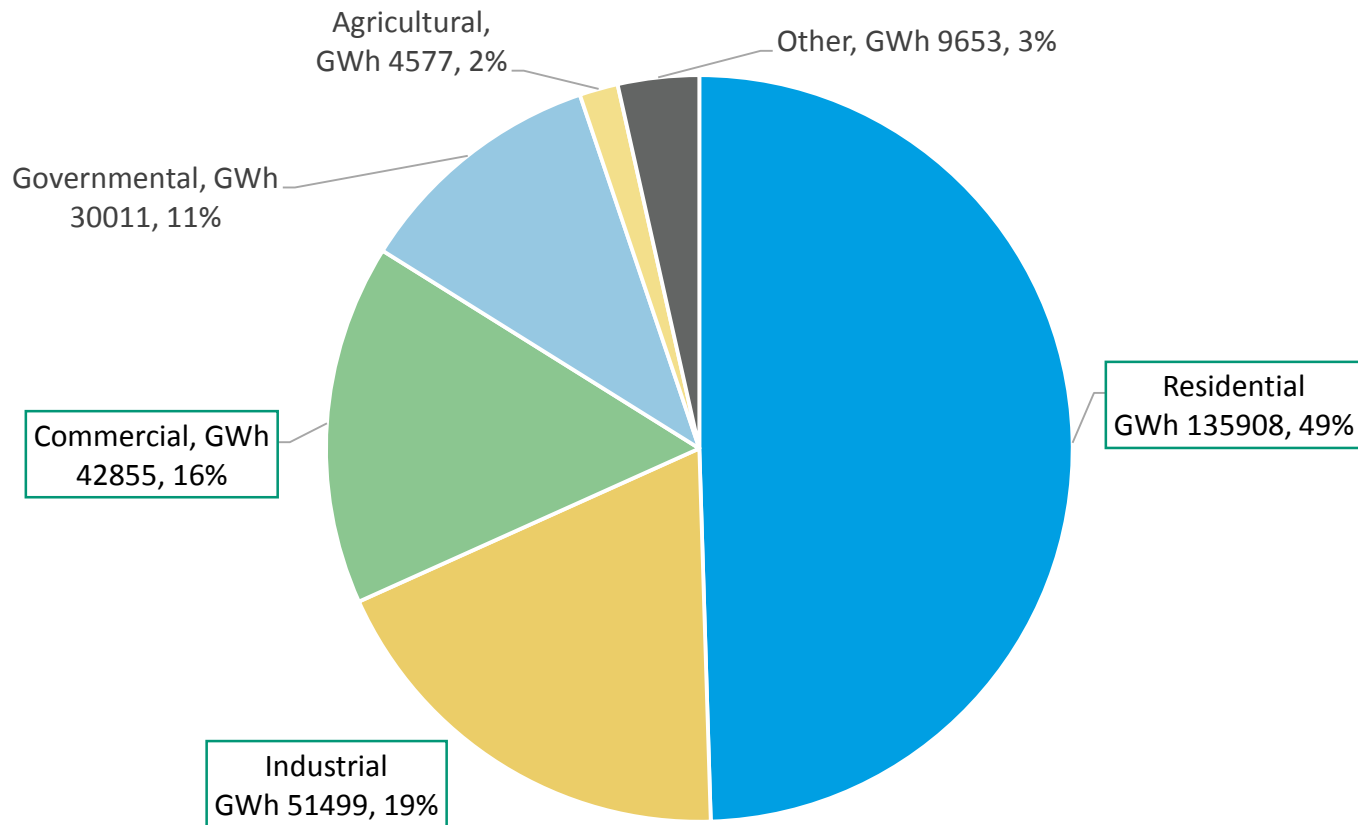


# Residential energy consumption in the GCC is rapidly increasing relative to other countries – is it getting full value from this?

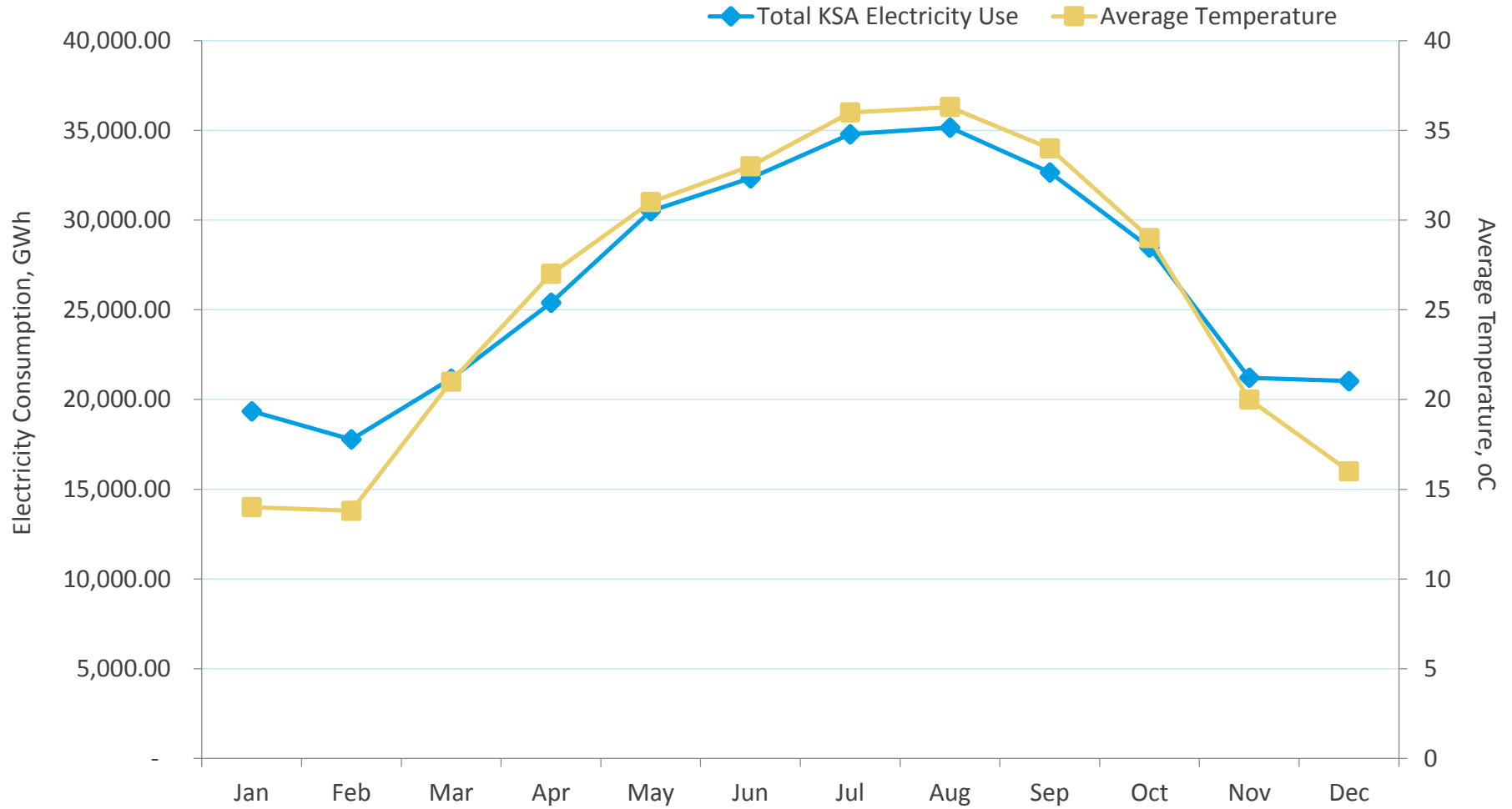


# Buildings sector as a percentage of total electrical consumption in KSA

## 2014 Electrical Consumption by Sector

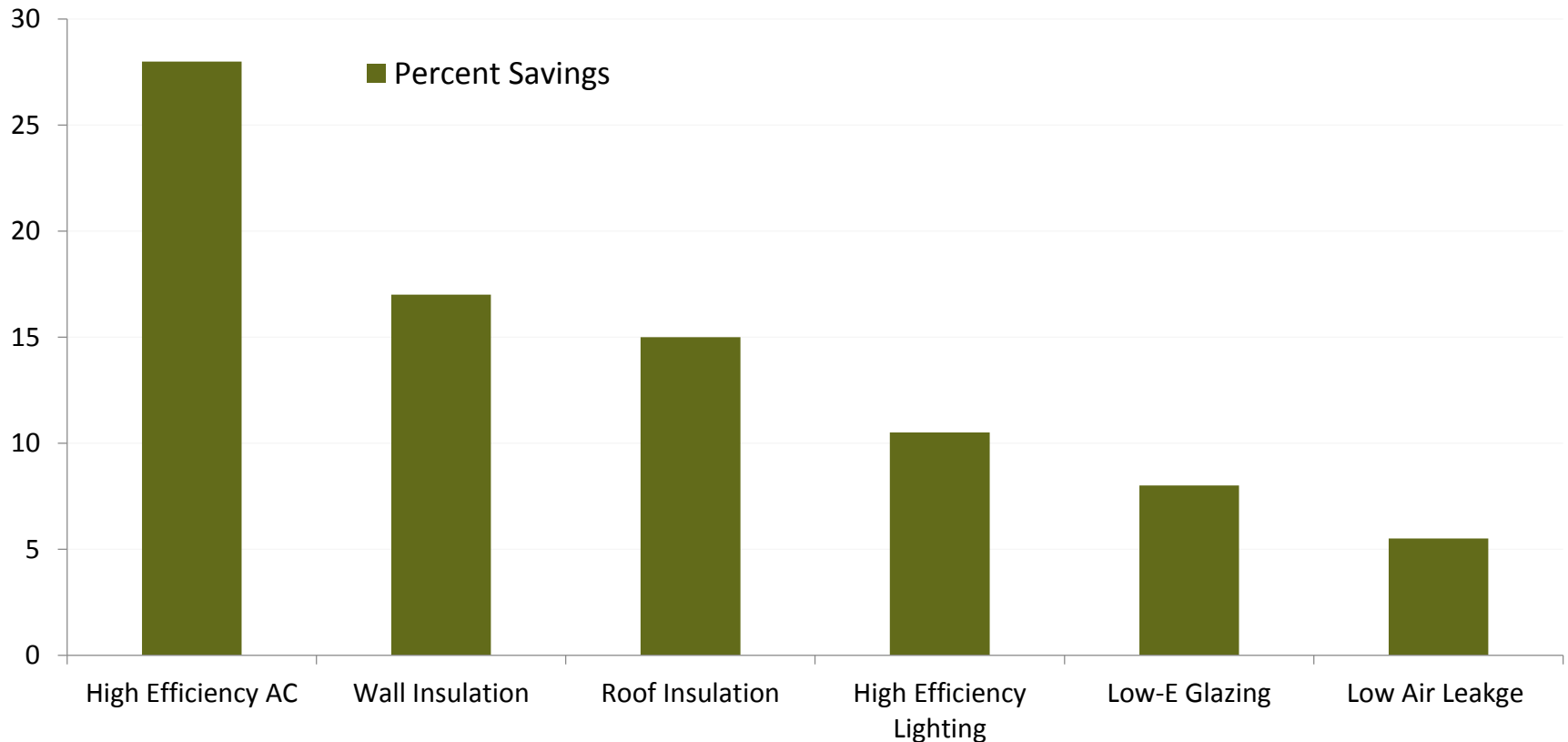


# Air conditioning drives seasonal change in electricity consumption



# Improving energy efficiency of air conditioning and building envelope are most effective measures for residential buildings

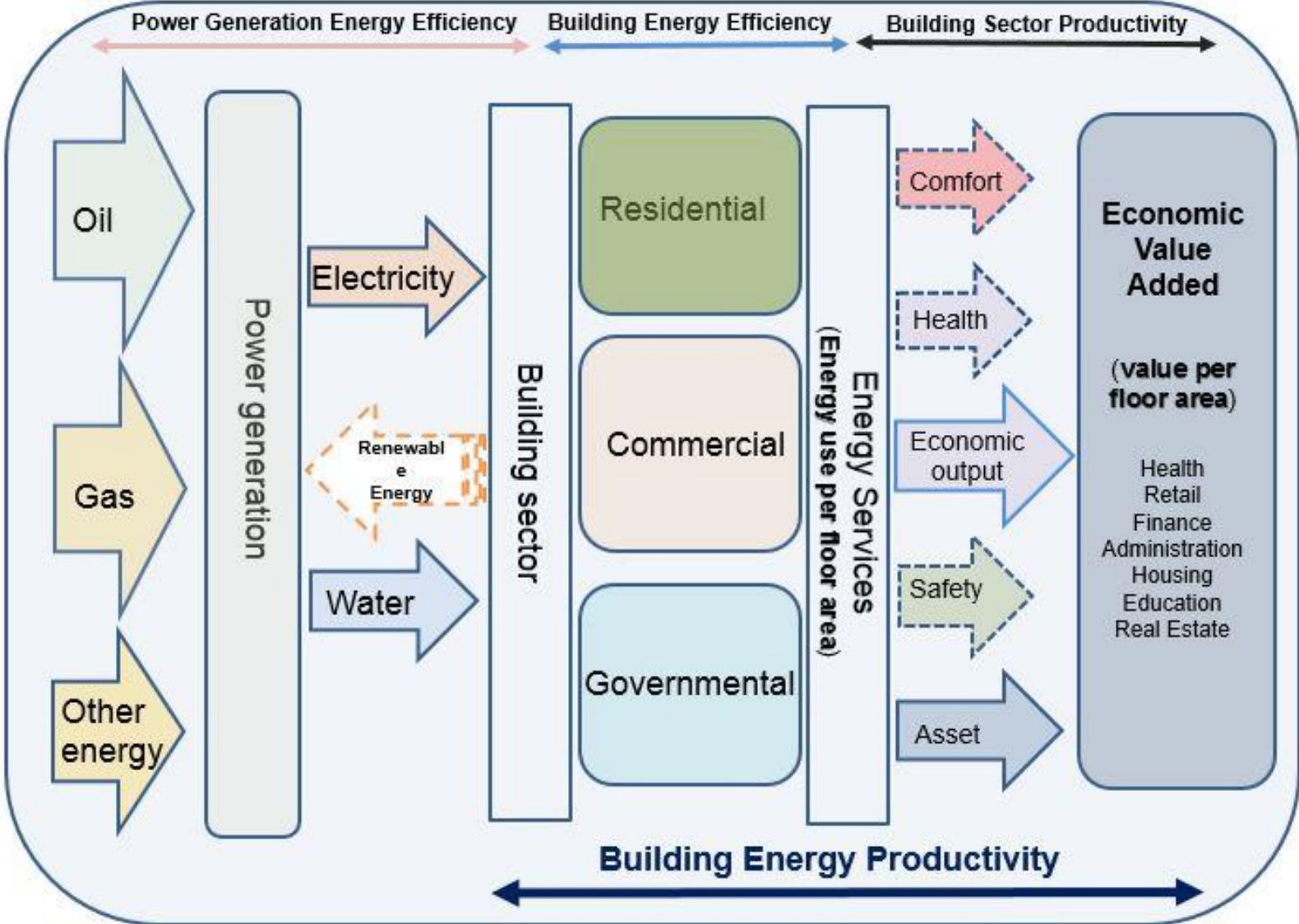
Percent Savings in Annual Energy Use Savings, Riyadh, KSA  
Prototypical Villa



Key findings from our EE analysis are – by improving EE of the Air conditioning systems and building envelopes (insulations), can reduce total energy consumption in residential buildings significantly. For instance using high efficiency AC we can reduce total electricity use by 27% in residential buildings.

This analysis is for an individual building level, each measure impacts total electricity consumption – interactive effect.

# Building Sector Energy Productivity



# KAPSARC Research: energy productivity in the buildings sector

## Key questions for research

Defining EP at the sector level

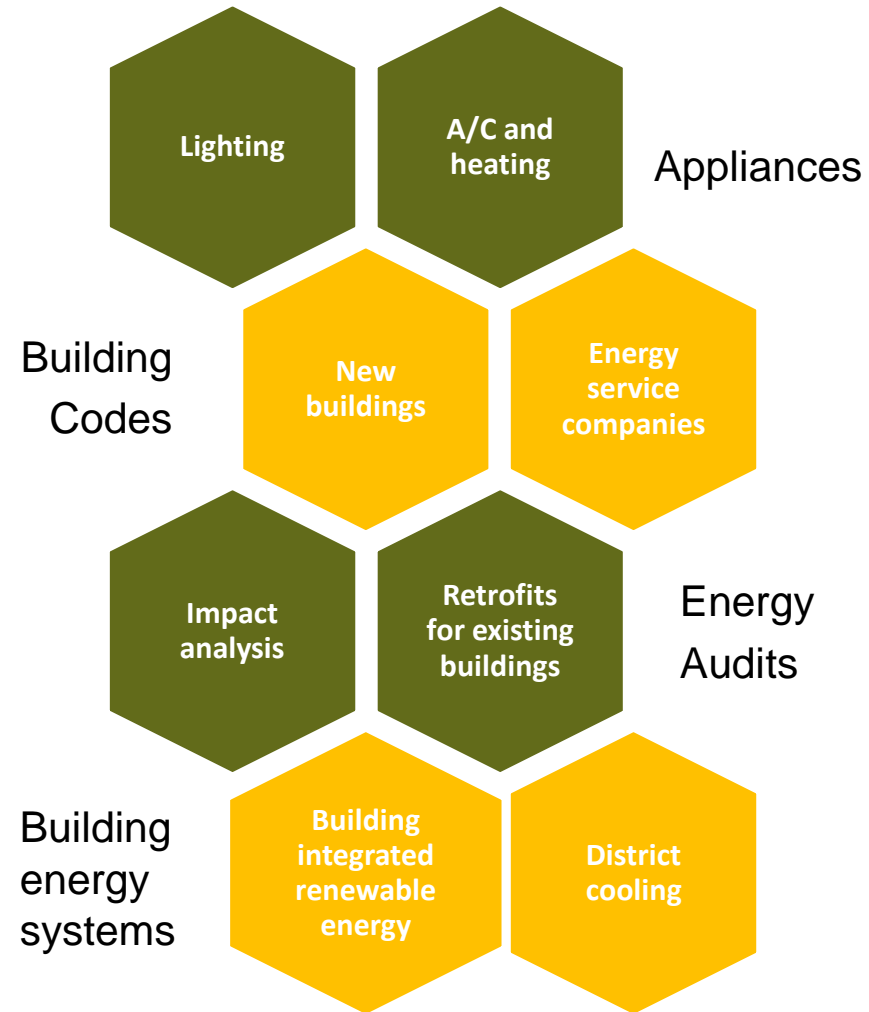
- International comparison of energy efficiency indicators
- Articulation of energy productivity indicators and comparison where possible

Benchmarking and analysis

- What policies have been implemented in GCC countries?
- Drawing on this and international experience, what more can be done?

Policy options

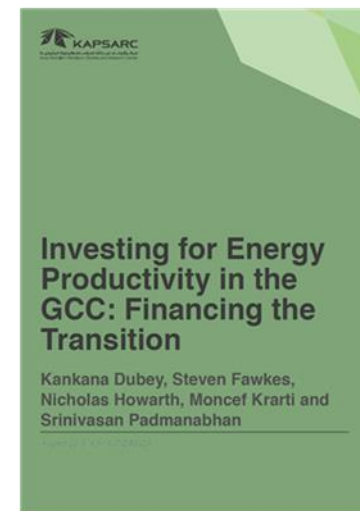
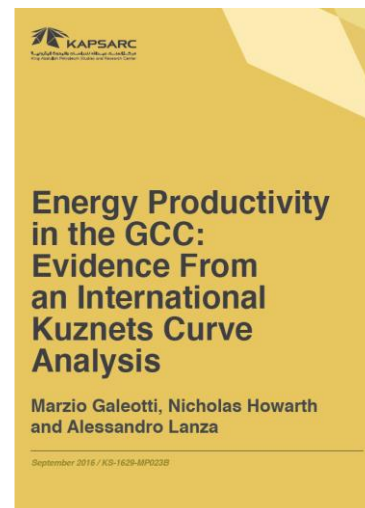
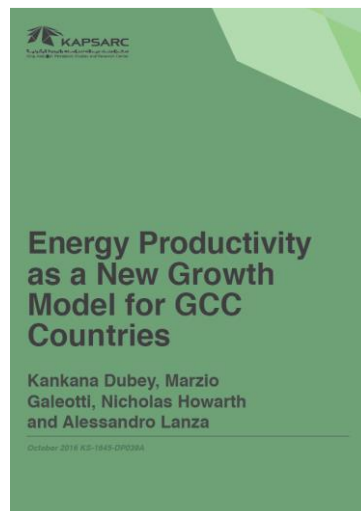
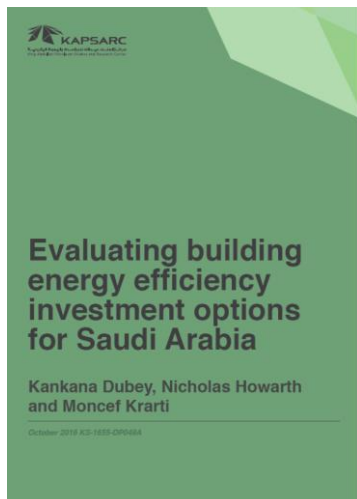
## Policy areas





# Thank you and further information

## Project research publications



Publications available at [www.kapsarc.org](http://www.kapsarc.org)

**Contact:**

[kankana.dubey@kapsarc.org](mailto:kankana.dubey@kapsarc.org)

# Annexure

# Status of Building Energy Efficiency Regulations in GCC countries

Country	Building EE Regulation	Type of Compliance	Mandatory/Voluntary
Bahrain	Thermal Insulation Requirements (1999)	Prescriptive	Mandatory
Kuwait	Energy Conservation Code of Practice No. R-6 (2014)	Prescriptive	Mandatory
Saudi Arabia	Saudi Energy Efficiency Building Code (2007)	Performance and Prescriptive	Mandatory
UAE (Dubai)	Thermal Insulation requirements (2003)	Prescriptive	Mandatory
	Green Building Regulations and Specifications (2011)	Performance	Voluntary
Qatar	Global Building Assessment System (GSAS): All new Public Buildings (2012) All new Commercial Buildings (2016) All new Residential Buildings (2020)	Sustainable Building Label System	Mandatory
Oman	None	NA	NA

# Lighting Energy Consumption: Phase out of Inefficient Lighting Systems

In GCC countries, the share of lighting in the total electricity consumption is slightly less: UAE – 10.4%, Saudi Arabia – 16.6%, Kuwait– 17.7%, Oman – 14.2% and Qatar – 11.4%

Country	Building EE Regulation	Status of Policy
Bahrain	Minimum energy performance standards have been developed for household light bulbs based on the EU Commission Regulation No 244/2009.	Adopted
Kuwait	None	NA
Saudi Arabia	Regulations are being prepared by SEEP to focus on the phase out of least efficient light sources in residential and Commercial buildings.	Under Preparation
UAE (Dubai)	The Emirates Authority for Standardization and Meteorology (ESMA) has banned the import and sales Of incandescent and low quality energy saving bulbs since January 1, 2015	Adopted
Qatar	The Ministry of Environment has issued a regulation banning the import of incandescent light bulbs (Tungsten) . First phase of the ban includes 100W and 75W incandescent bulbs. The implementation of the regulation shall be effective starting from 2014.	Adopted
Oman	None	NA

# Status of Minimum energy performance standards (MEPS) for Air Conditioning and Appliances in GCC countries

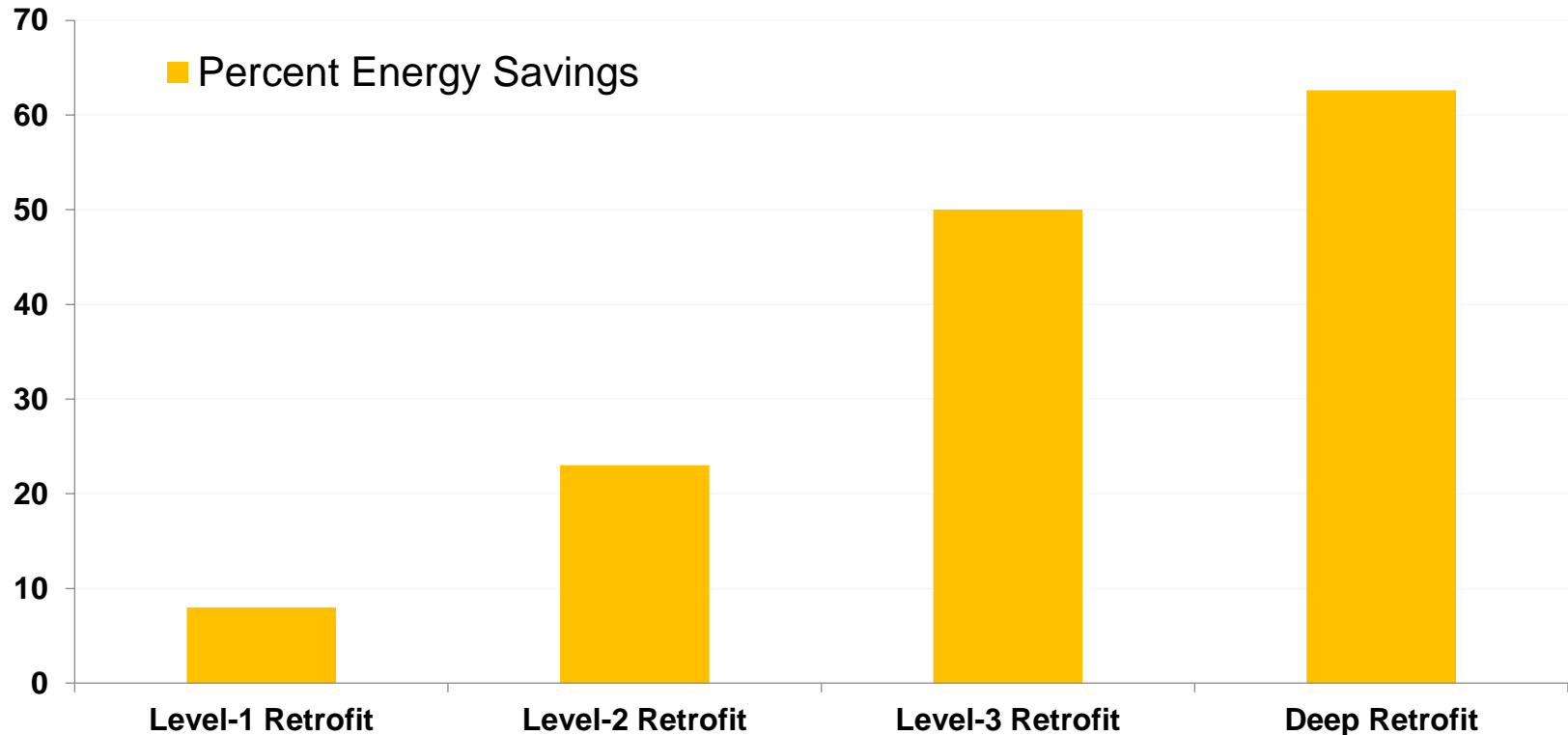
Country	Regulation Type	Status of Policy
Bahrain	Air Conditioners	Under preparation
Kuwait	Air Conditioning Systems	Adopted since 1983 as part of the Energy Conservation Code of Practice for Buildings
Saudi Arabia	Air Conditioning Systems	Adopted since 1983
UAE (Dubai)	Air Conditioning Systems, Refrigerators, and Washing machines	Adopted since 2013
Qatar	Air Conditioning Systems	Adopted since 1983
Oman	Not Available	NA

**Renewable energy systems:** Only UAE require installation of Solar Water heaters in all new villas and labor accommodations to provide 75% of domestic hot water requirements. Moreover, the building regulation of Dubai further promotes renewable energy applications by requiring sourcing any additional lighting load that exceeds the specified light power density through renewable sources, such as photovoltaic systems.

**Air Conditioning Systems:** Air conditioning makes up to 70% of the GCC's annual peak electricity consumption, with cooling demand expected to triple by 2030 (Strategy&, 2012). Cooling makes up over 70% of electricity consumption in the residential sector in Saudi Arabia, and about 40% of the total annual electricity consumption in the kingdom (ElKhoury, 2012). Air conditioning accounts for up to 60% of the peak load consumption in the UAE (Al Ramahi, 2014), and, in Qatar, it accounts for up to 70% during the summer and 50% annually (Darwish, 2013).

In three GCC countries, Saudi Arabia, Qatar and UAE, the adoption of MEPS is a recent development; most standards were adopted in 2013-2014 and enforcement is still to be seen. In Kuwait, standards for air-conditioners were adopted in 1983 and require revision.

# Large scale retrofits in KSA can reduce building energy consumption by over 50%



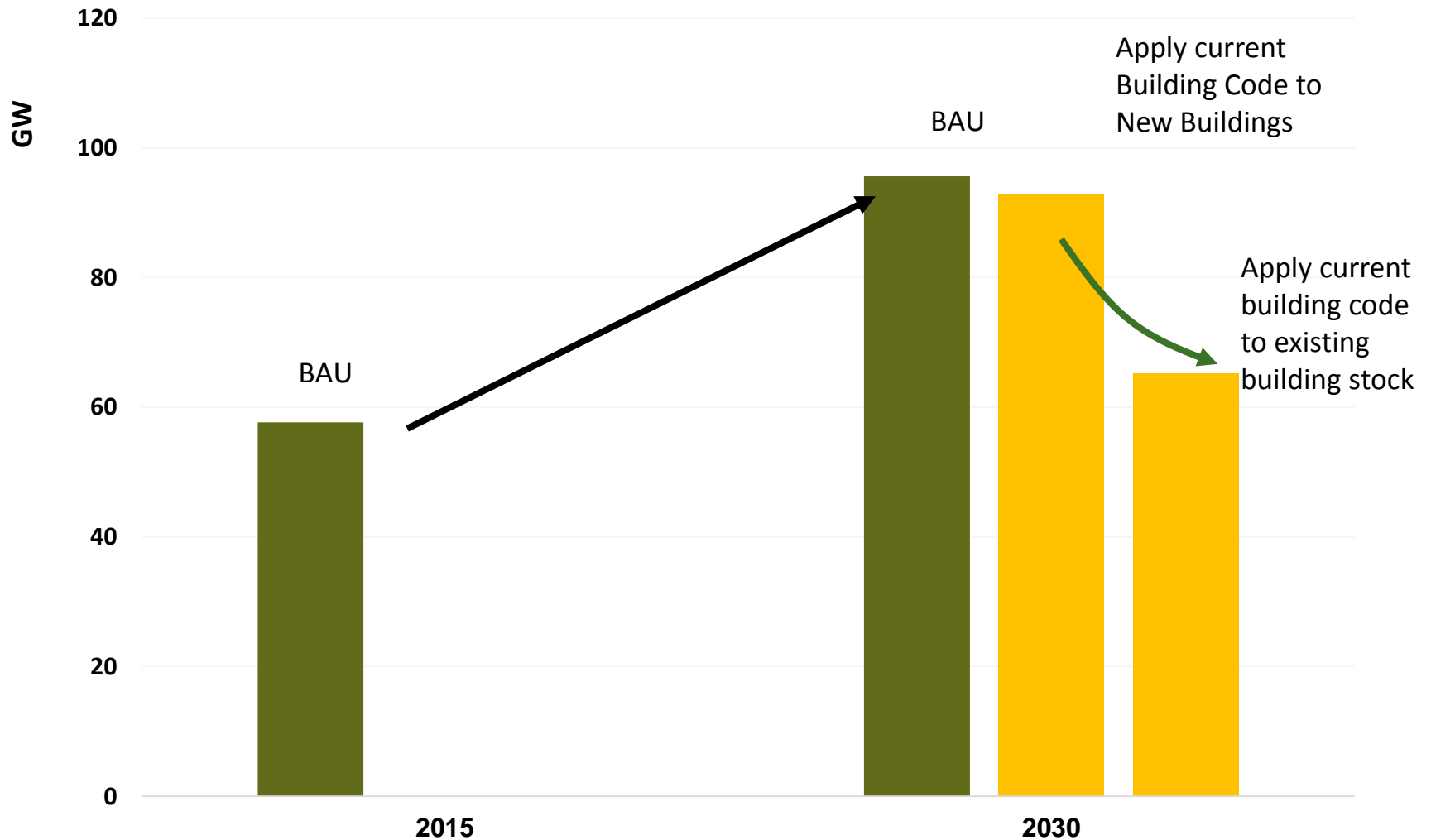
**Level 1** – implementing low cost energy efficiency measures, installation of thermostat, Use of CFL or LED lighting and reduce air leakages.

**Level 2** – Level 1 + use of energy efficient cooling systems and appliances.

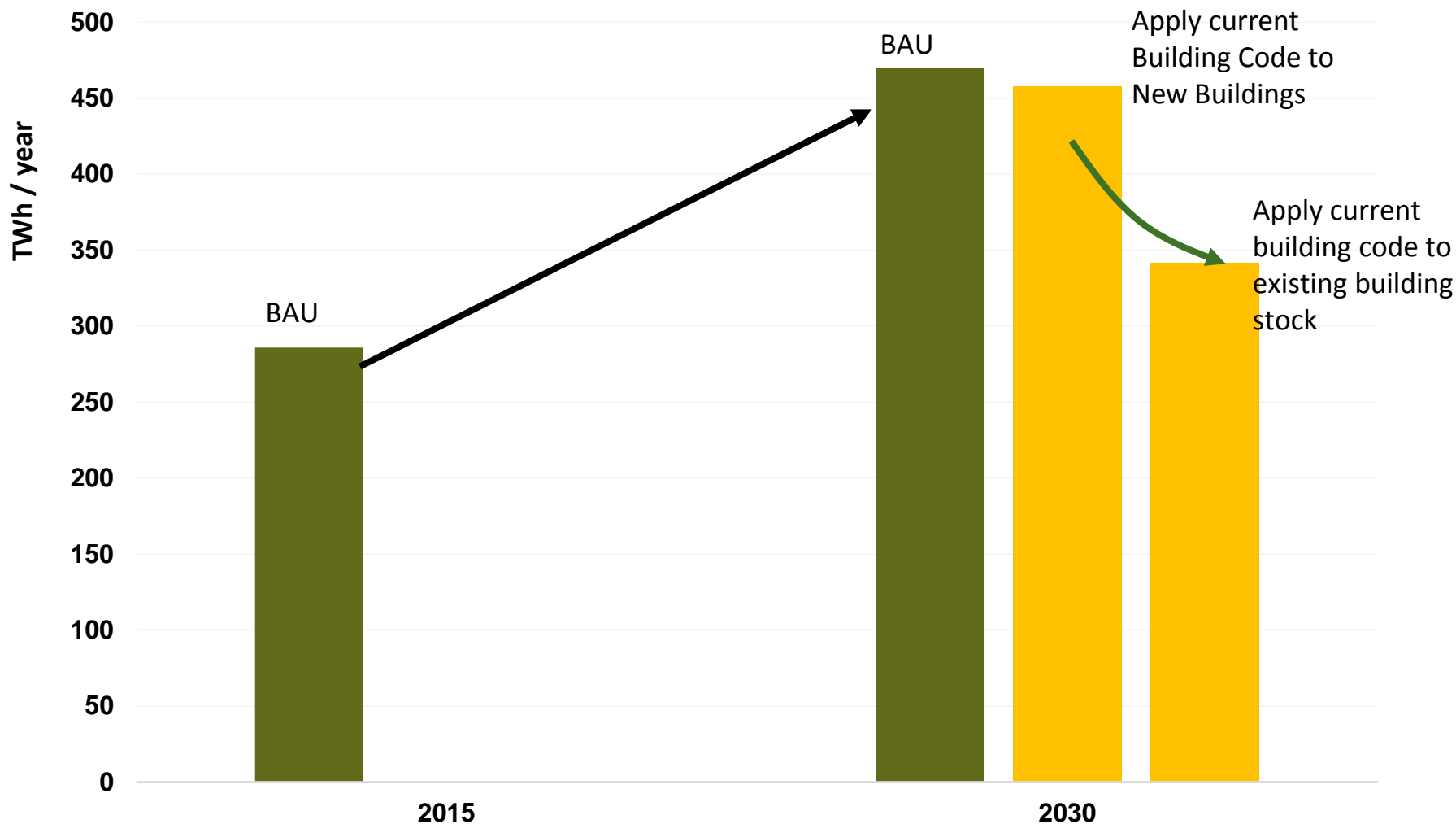
**Level 3** – Level 1 and 2 +deep retrofit programs, such as window replacement, cooling system replacement, installation of daylighting control systems

**Deep** – Optimized set of energy efficiency determined based on life-cycle cost analysis

# Large scale building retrofit programs can potentially lead to 30% in total KSA electrical peak demand savings



# Large scale building retrofit programs can lead to 27% in total KSA electricity consumption savings





# Further research: moving from energy efficiency to energy productivity policy

## Energy productivity: beyond energy efficiency

### Energy productivity

Non-energy benefits a main driver

### Energy efficiency

Focus on savings

Optimizing energy

Optimizing growth

Operational

Predominantly  
micro-economic

Predominantly  
macro-economic  
structural change

Non-energy benefits relevant  
but not typically main driver

Focus on value

Strategic