



# Energy Efficiency Market Report 2022 and Implications for Southeast Asia

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60th Meeting of APEC Expert Group on Energy Efficiency & Conservation (EGEEEC60), 15 March 2023

- Recent trends in energy efficiency and energy demand
- Policy and technology
- Energy efficiency and the energy crisis
- Special focus on energy efficiency in ASEAN countries

## Energy efficiency 2022

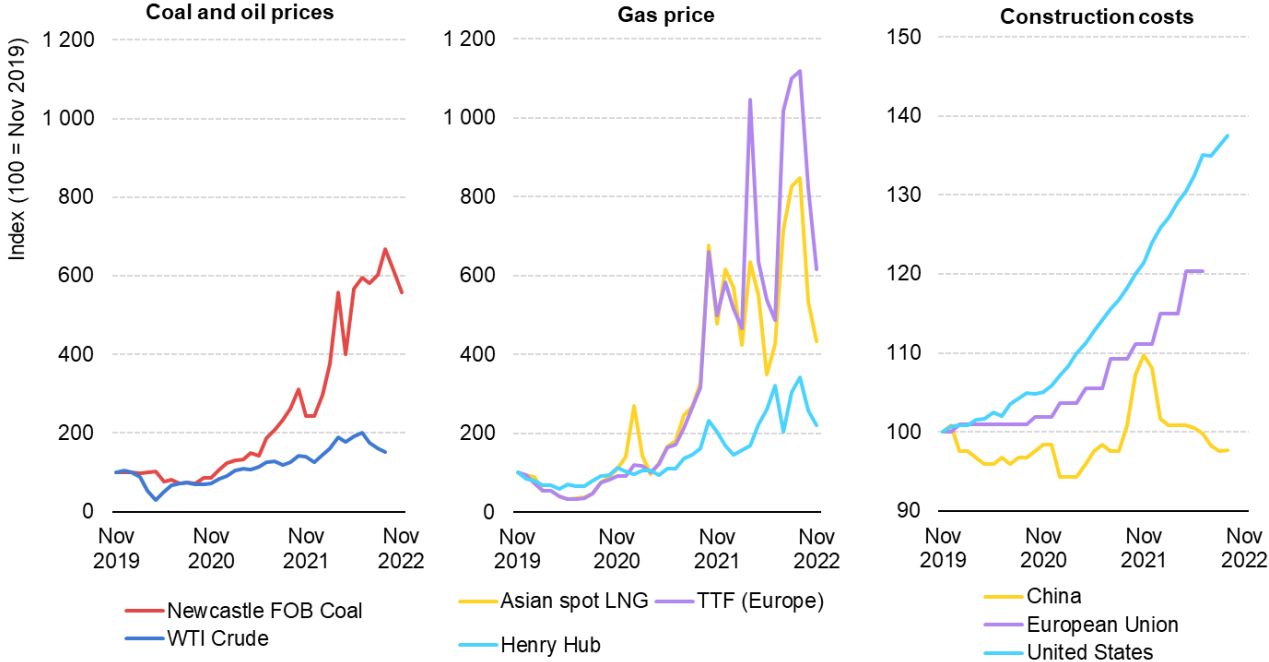
The first fuel in responding to the energy security, affordability and climate crisis



# Energy crisis is putting the spotlight on the efficiency agenda

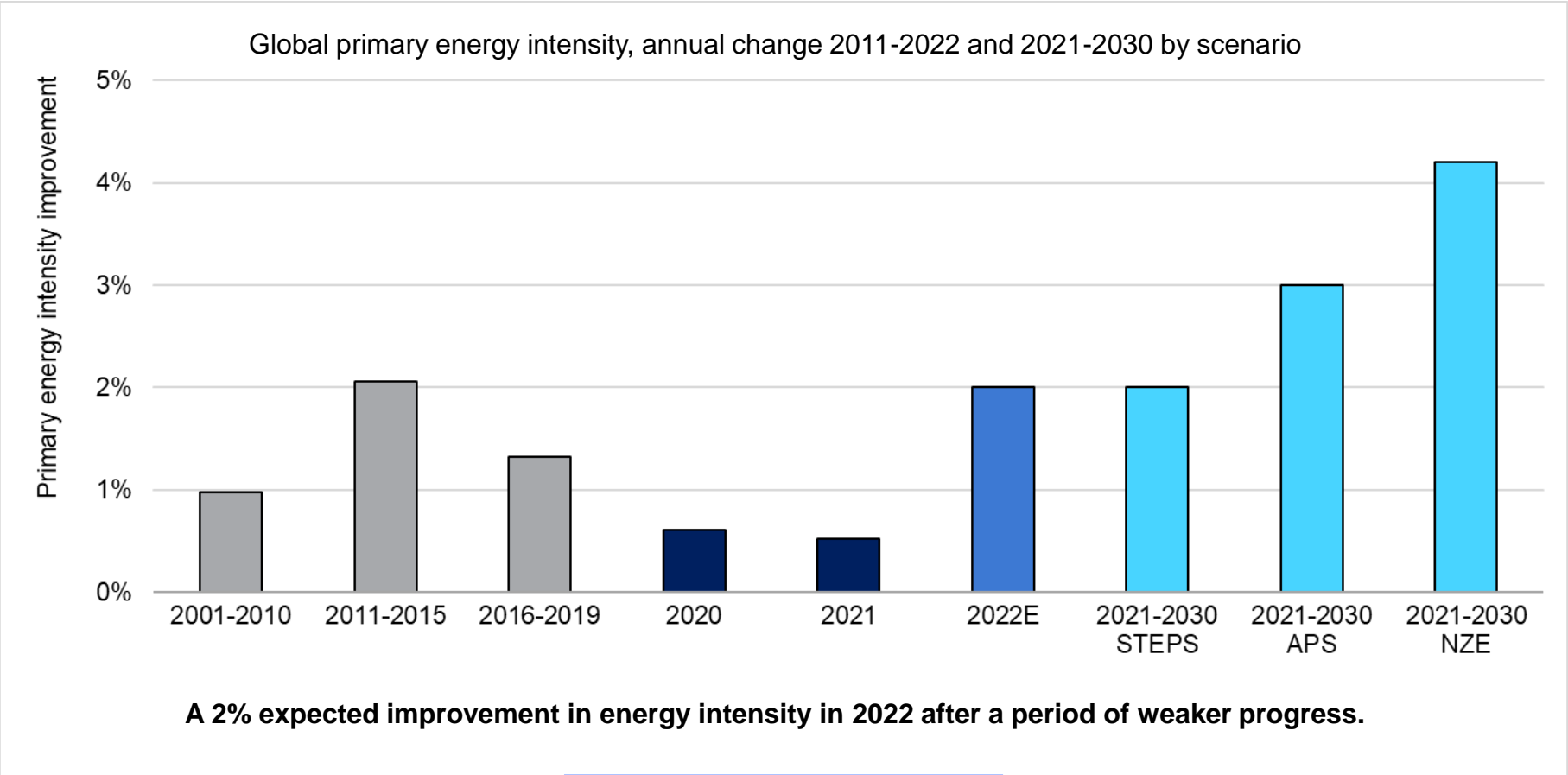


Wholesale energy price and construction cost indices 2019-2022



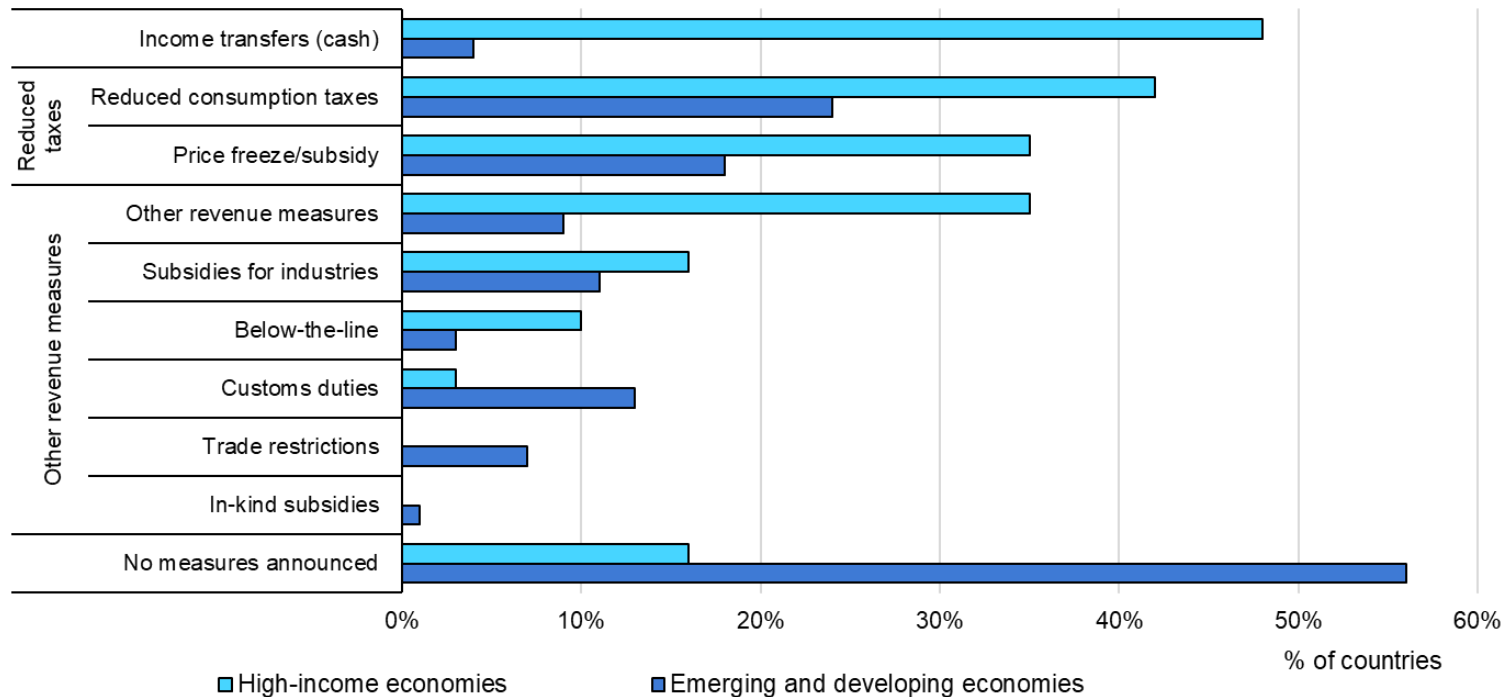
**Governments are turning to efficiency as it can simultaneously meet affordability, security and climate goals.**

# Emerging signs of a turning point for energy efficiency in 2022



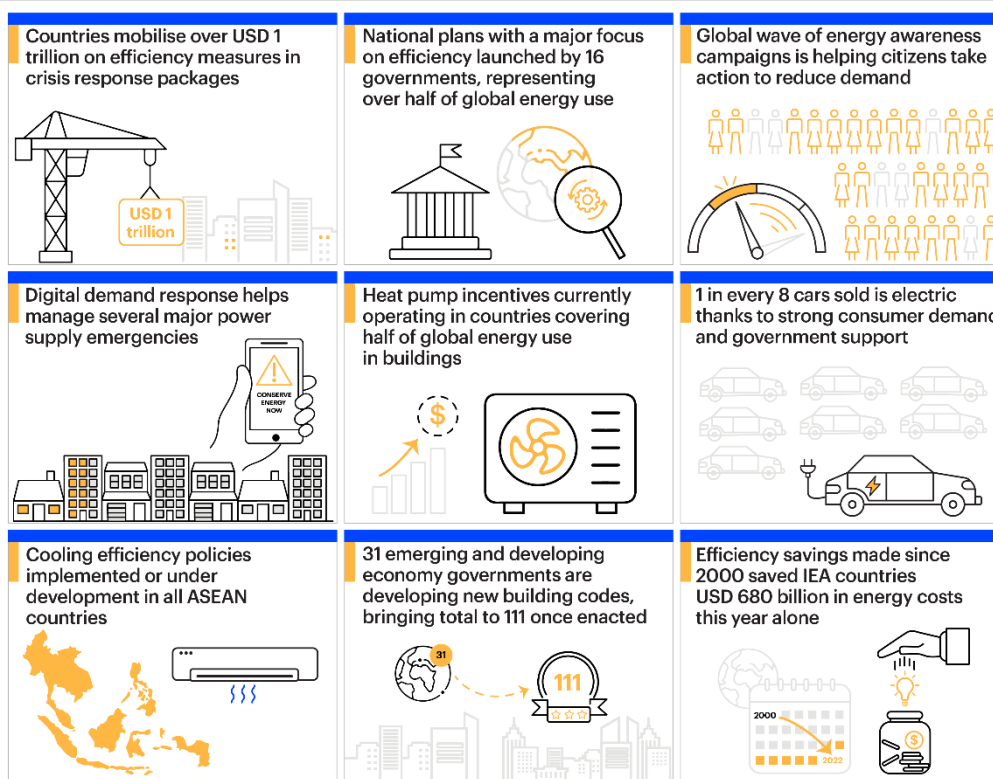
# Short-term consumption subsidies buffer fuel price increases

Measures announced by 134 countries in response to high energy prices, April 2022



**In the long-run, well targeted public spending can support the vulnerable and enhance energy efficiency**

# Will 2022 see a turning point for energy efficiency progress?



Many hopeful signs through new policy focus, but challenges remain



ASSOCIATION  
OF SOUTHEAST  
ASIAN NATIONS

A COMMUNITY OF  
OPPORTUNITIES FOR ALL

- ASEAN is home to more than 660 million people.
- Most of the economies have doubled in size over the past two decades, and it is moving towards becoming one of the largest regional market for goods and services in the world.
- At the same time energy demand has been growing by around 3% per year.
- Three-quarters of growth in energy demand between now and 2030 is expected to be met by fossil fuels under current policy settings.

Brunei Darussalam  
Cambodia  
Indonesia  
Lao PDR  
Malaysia  
Myanmar  
Philippines  
Singapore  
Thailand  
Viet Nam

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**Roadmap Towards Sustainable and Energy-Efficient Space Cooling in ASEAN**

International Energy Agency

**iea**

**Roadmap for Energy Efficient Buildings and Construction in ASEAN**

Timelines and actions towards net-zero carbon buildings and construction

International Energy Agency

**Interactive Online Training**

Singapore-IEA Regional Training Programme on Efficient Grid-Interactive Buildings

5-7 July 2022  
8am - 12pm Paris / 2pm - 6pm Singapore

**Self-paced Online Course**

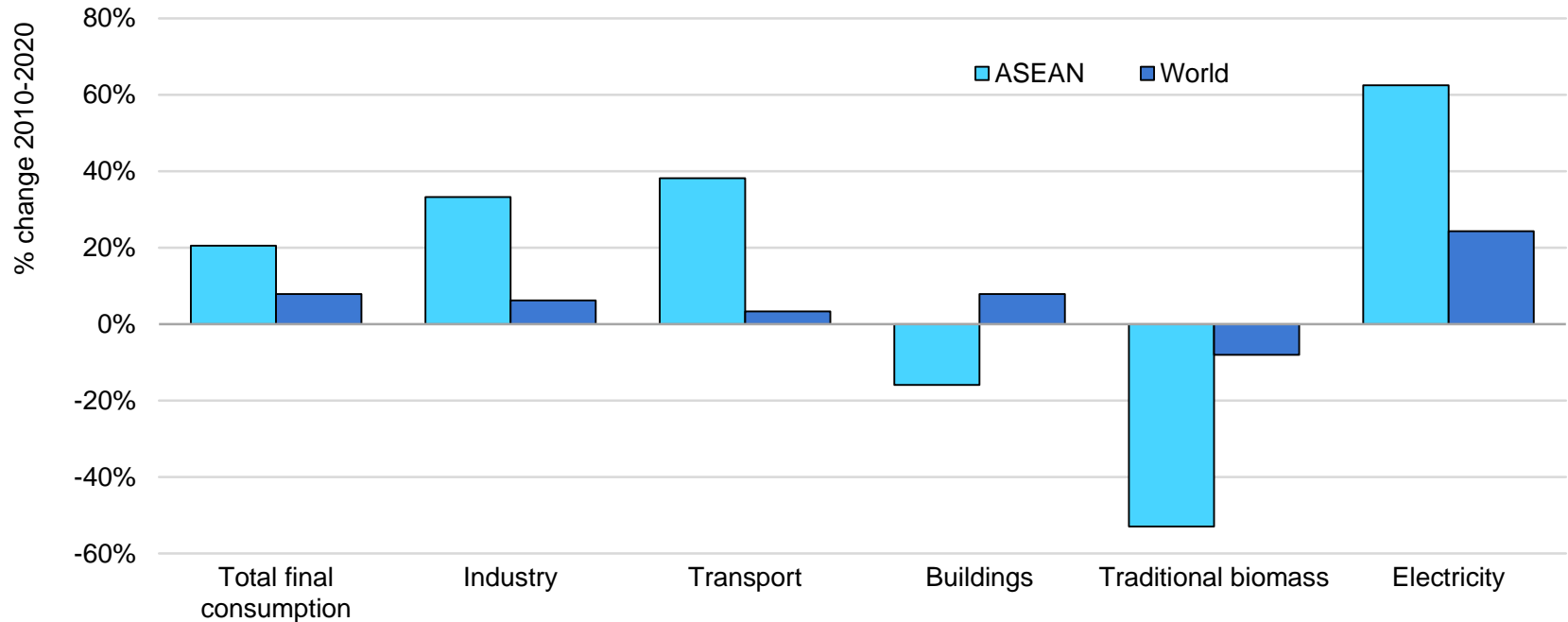
IEA  
EE6

Singapore-IEA Regional Training Programme on Efficient Grid-Interactive Buildings



# Energy demand is growing rapidly in the ASEAN region

Energy consumption trends in ASEAN and World, % change 2010-2020



**Demand is being driven by increased wealth and access to energy services.**

- Access to clean cooking technologies has almost quadrupled during the past 2 decades, reaching 70% of the population but more than 200 million people in the region, mainly in rural areas, are being left behind.
- The World Bank values the negative impacts related to health, gender inequality, and environmental issues linked to the lack of the universal access to clean cooking at USD 280 billion per year.



Image: Creator: Eric Sales, Copyright: [2009 ADB](#). All Rights Reserved.

**In the last year, due to the Covid-19 and energy crises, 100 million more people may no longer be able to cook with clean fuels and 70 million can no longer afford electricity**

# Efficiency and electrification are key to the future of ASEAN transport

- Globally fuel economy standards play a key role in reducing future oil requirements in the transport sector.
- However, so far none of the ASEAN member states have adopted fuel economy or CO2 emission standards for any modes of transport.
- Two- and three-wheelers are key transport modes in ASEAN countries and provide opportunities for electrification.



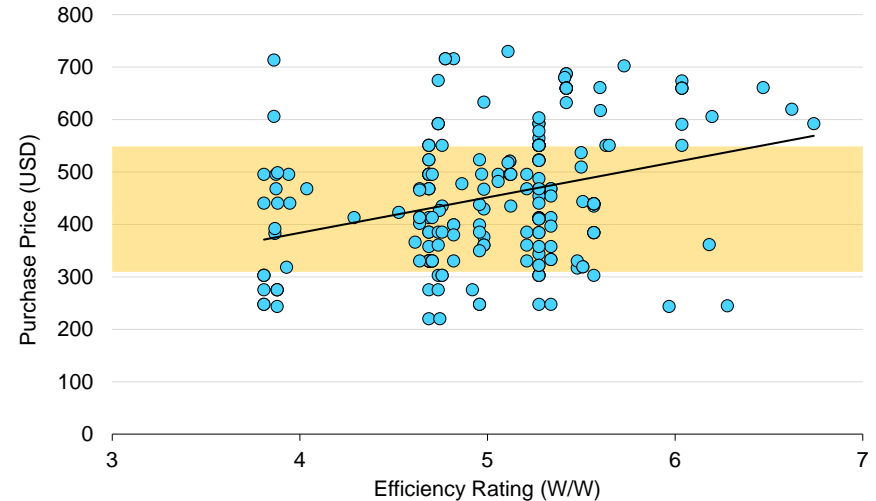
[Image source:](#) EIAS



[Image source:](#) Reglobal

- Space cooling is among the fastest growing end uses in the region, with electricity consumption expected to more than quadruple by 2040.
- Market data shows that more efficient cooling systems are not necessarily more expensive.

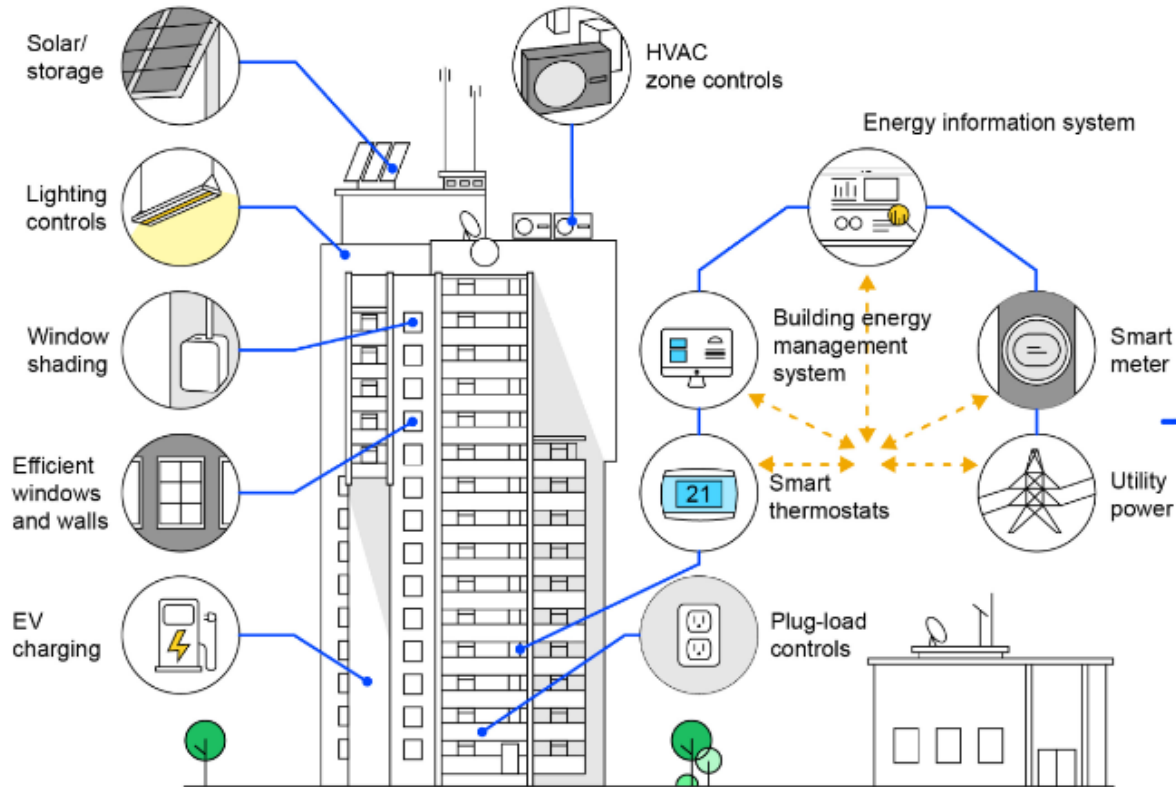
AC energy efficiency versus purchase price, Thailand, 2022



**Policy action on more efficient ACs, fans and building envelopes could reduce space cooling energy use by over one-third by 2040**

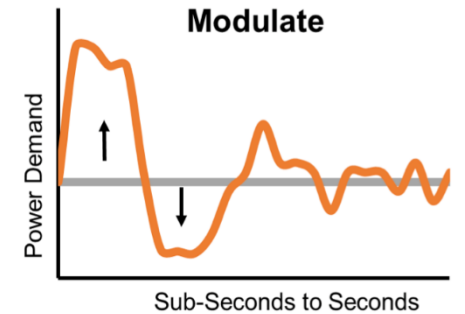
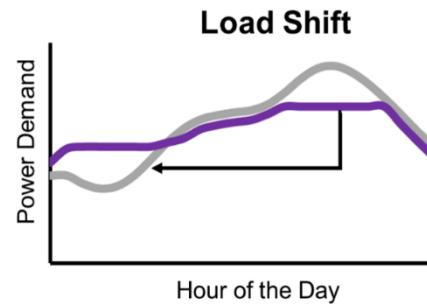
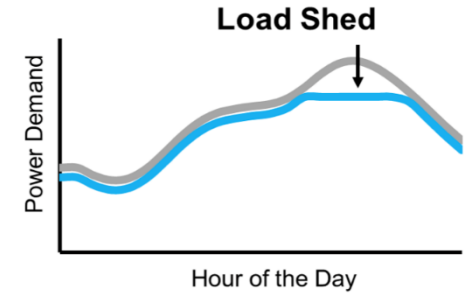
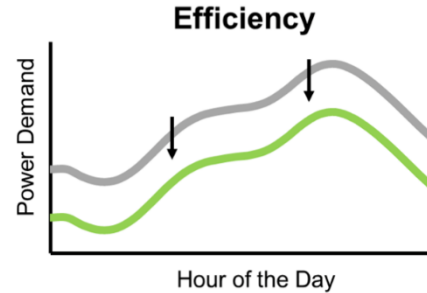
# Grid-interactive buildings – provide efficiency and flexibility

## Grid-interactive efficient buildings



**Efficient grid-interactive buildings** are energy efficient buildings with smart technologies characterized by the active use of distributed energy resources (DERs) to optimize energy use for grid services, occupant needs and preferences, and cost reductions in a continuous and integrated way

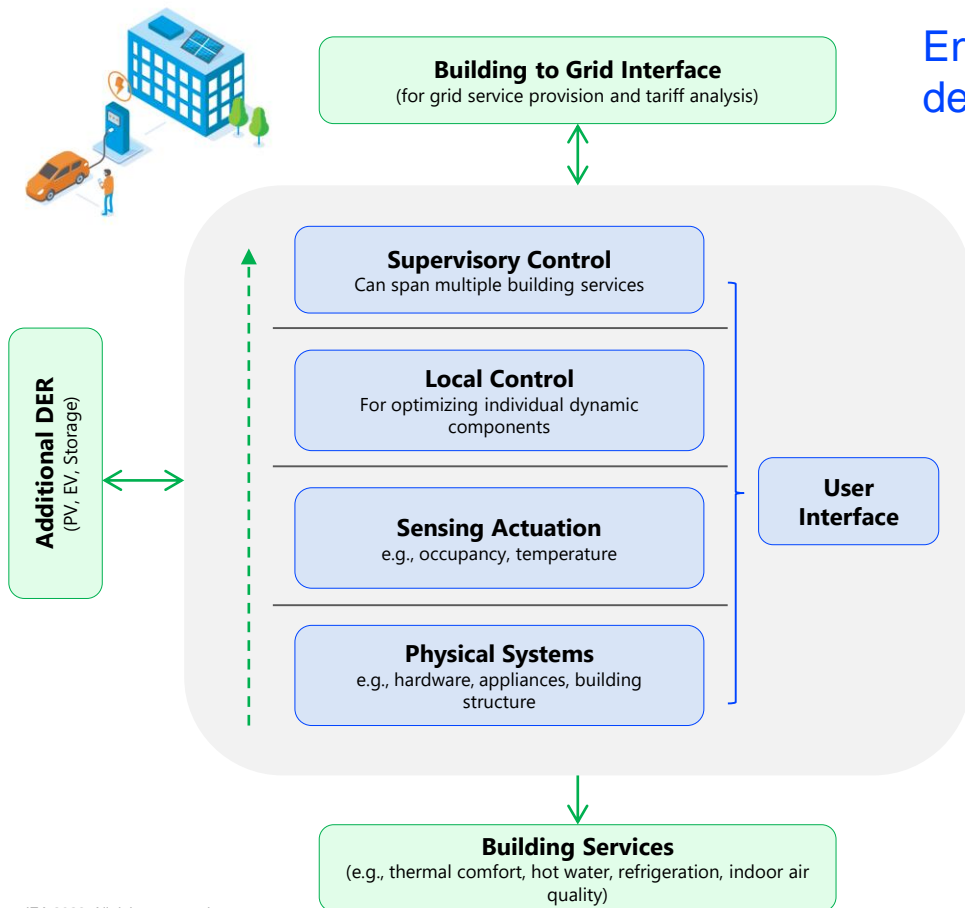
- **Efficiency:** the ongoing reduction in energy use while providing the same or improved level of building function.
- **Load Shed:** the ability to reduce electricity use for a short time period and typically on short notice.
- **Load Shift:** the ability to change the timing of electricity use. In some situations, a shift may lead to changing the amount of electricity that is consumed.
- **Modulate:** the ability to balance power supply/demand or reactive power draw/supply autonomously in response to a signal from the grid operator during the dispatch period.
- **Generate:** the ability to generate electricity for on-site consumption and even dispatch electricity to the grid in response to a signal from the grid.



[Source](#)

## Interesting fact

From 2010 to 2017, over 250 TWh of variable renewable electricity was curtailed globally, (~180 Mt CO<sub>2</sub> emissions) equivalent to annual Spain's electricity demand



Ensuring interoperability means taking actions to develop standards and facilitate data exchange

## Physical Systems and Sensing Actuation

Many smart thermostats have the capability to provide building-to-grid communication. Some water heaters use a **CTA-2045** communication module to communicate with the grid. Each layer could be embodied with individual technology.

## Supervisory Control and Local Control

Grid communication can occur from either local or supervisory control systems. Building Automation Systems (BAS) or Smart Home Energy Management Systems (SHEMS) provide the capability to integrate multiple layers. An example of this is **BACnet**.

## Communication with Grid

There are some standards to support interoperability between the building and grid communication, for example **OpenADR**, and **IEEE 2030.5 Smart Energy Profile**.

# Virtual Power Plant (VPP)

**Aggregators** bundle DERs to engage as a single entity – a virtual power plant (VPP) – in power or service markets

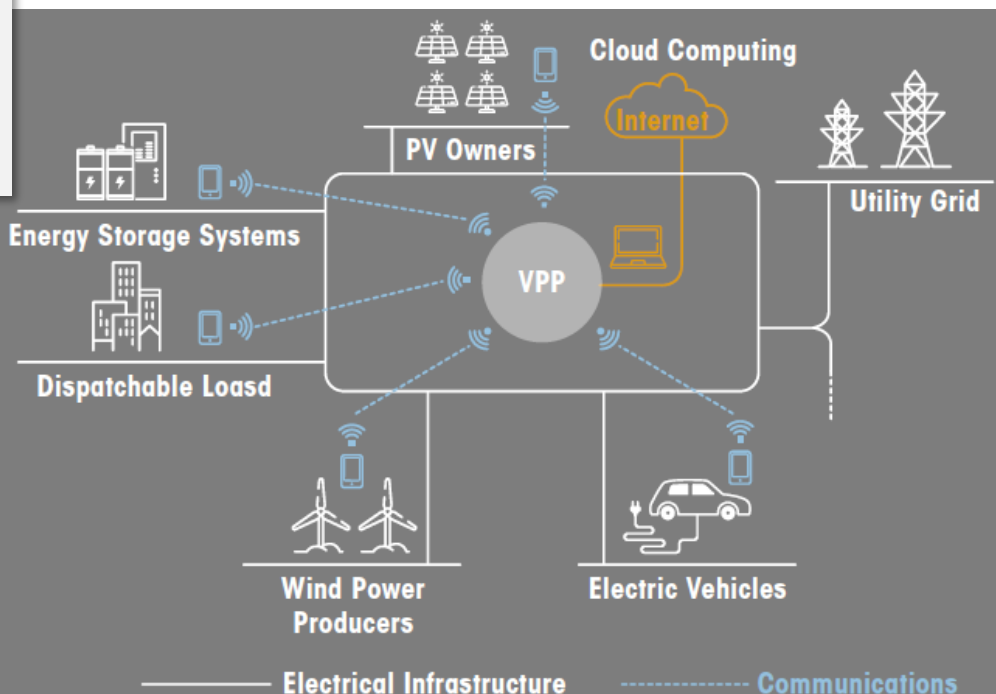
A **VPP** is a system that relies on software and a smart grid to remotely and automatically dispatch and optimise the distributed energy resources

Aggregators use a centralised IT system to remotely control the DERs and optimise their operation.

**They can provide:**

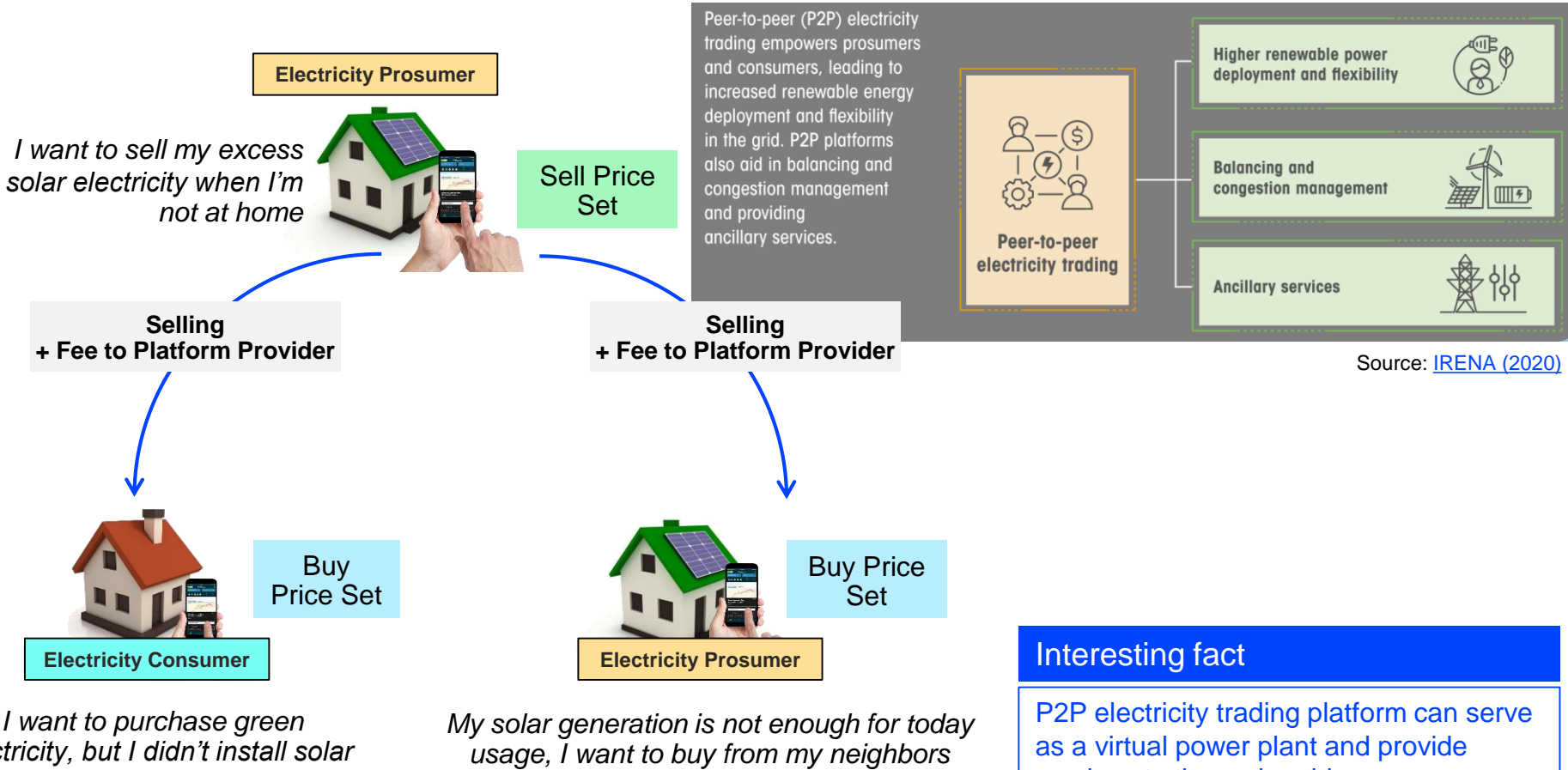
- Load shifting
- Balancing services to TSOs
- Local flexibility to DSOs

Source: [IRENA \(2019\)](#)





# Peer-to-Peer (P2P) [renewable] electricity trading

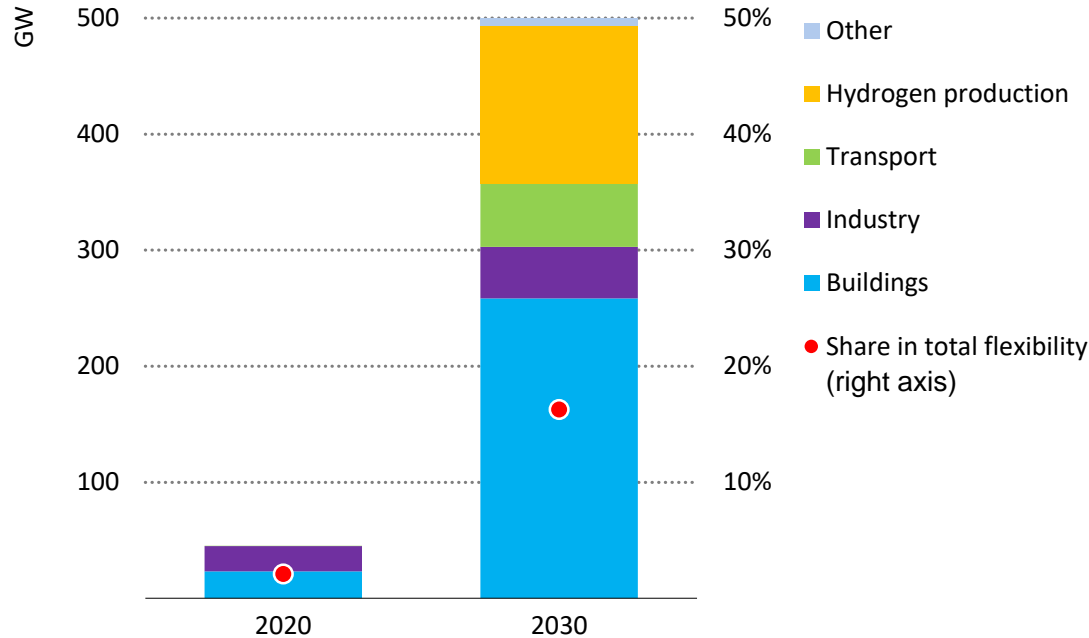


## Interesting fact

P2P electricity trading platform can serve as a virtual power plant and provide services to the main grid

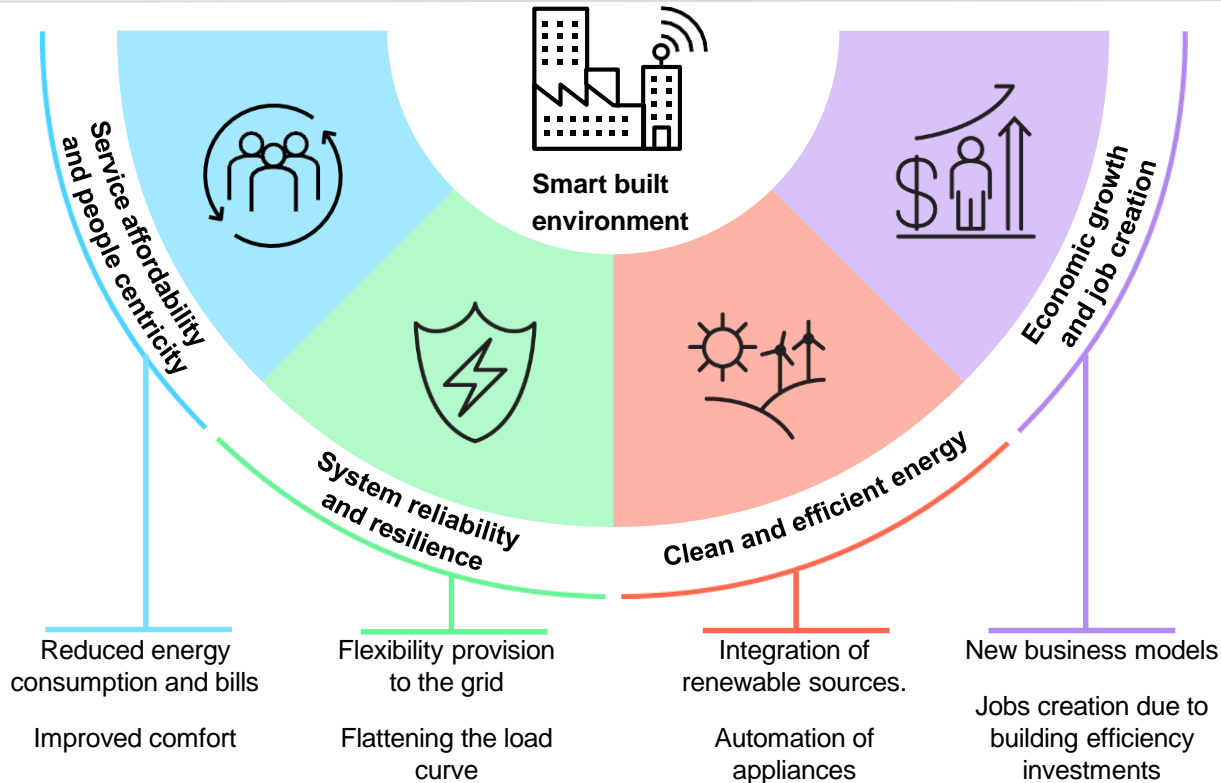
# In net-zero scenario, demand-response availability increases tenfold in the next ten years, mostly coming from buildings

Demand response availability at times of highest flexibility needs and share in total flexibility provision in the Net Zero Scenario, 2020 and 2030



Actions taken in this decade to open markets to demand-side participation, encourage new business models and establish controllability standards for equipment and appliances

# Smart technologies in buildings can bring a wide range of benefits



Policy, regulatory, technology and investment context needed to accelerate power system decarbonisation and digitalisation and effective utilisation of demand side resources, incl. buildings

# Policy package is needed for efficient grid-interactive buildings

## Regulations to

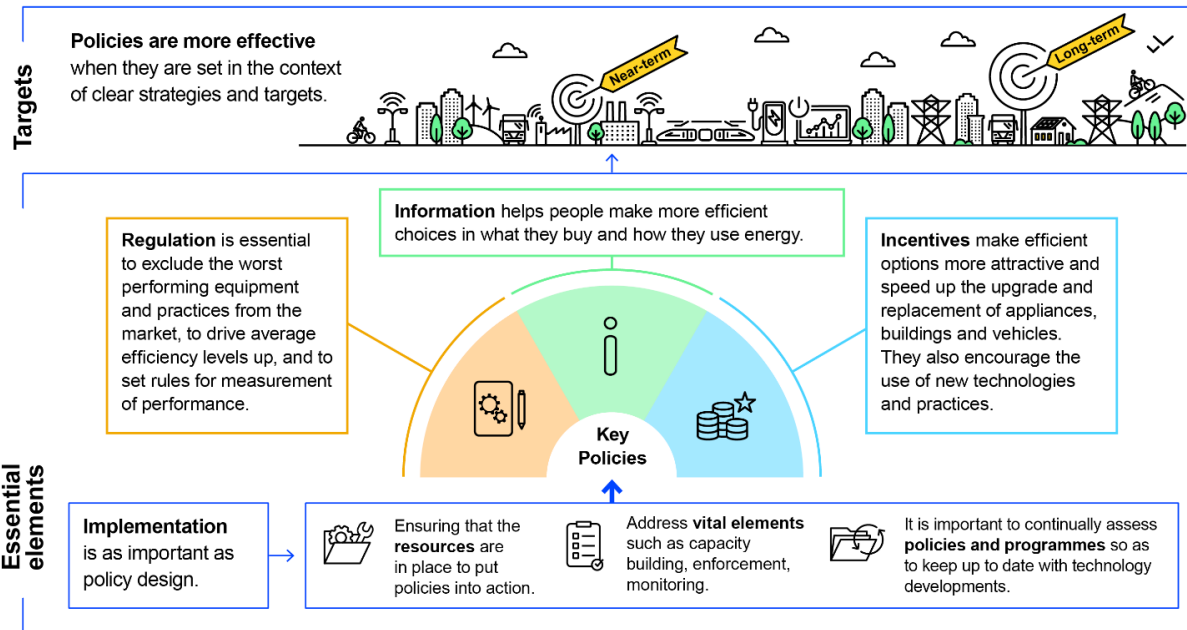
- allow participation of aggregators in electricity markets
- allow DERs to provide services to the central/ local grids
- mandate smart meters and smart grid infrastructure
- establish rules on data collection, cybersecurity and privacy

## Supportive policies to

- encourage decentralisation of power systems and better utilisation of existing grid infrastructure
- implement regulatory sandboxes for DERs coordination and disseminate results
- enable trade of power among prosumers and consumers without renewable generation capacities

## Policy Packages for Energy Efficiency

In all sectors the greatest efficiency gains are achieved by a package of policies that combine three main types of mechanisms: **Regulation**, **information** and **incentives**. Careful design and implementation will deliver efficiency's full potential to enhance energy security, create jobs, increase living standards, cut energy bills and reduce emissions.



# Case Study: California Buildings Standards



**40 YEARS  
OF ENERGY EFFICIENCY  
STANDARDS FOR  
BUILDINGS AND  
APPLIANCES HAVE  
SAVED CALIFORNIANS  
MORE THAN  
\$100 BILLION**

The **2022 California Building Energy Code** strongly incentivizes all-electric construction

focuses on four key areas in newly constructed homes and businesses:

- **Encouraging electric heat pump technology** for space and water heating, which consumes less energy and produces fewer emissions than gas-powered units; new homes to be wired in ways that ease and encourage use of electricity for heating and other appliances.
- **Establishing electric-ready requirements** for single-family homes to position owners to use cleaner electric heating, cooking and electric vehicle (EV) charging options whenever they choose to adopt those technologies.
- **Expanding solar photovoltaic (PV) system and battery storage standards** to make clean energy available onsite and complement the state's progress toward a 100 percent clean electricity grid;
- to include solar power and battery storage in many new and renovated commercial structures as well as high-rise residential projects
- **Strengthening ventilation standards** to improve indoor air quality
- **Requiring to install demand response automation** technology: thermostats, HVAC systems, networked lighting controllers, BASs must have two-way communication and be demand responsive using OpenADR, a common open industry led standard.

## 2022 Energy Code Benefits



Increases on-site renewable energy generation from solar.



Increases electric load flexibility to support grid reliability.



Reduces emissions from newly constructed buildings.



Reduces air pollution for improved public health.



Encourages adoption of environmentally beneficial efficient electric technologies.

that is looking at buildings as one of the key actors of the clean energy transition and distributed energy resources. In this regard the study will map opportunities and challenges for interaction between buildings

Supported by and in collaboration with



Efficient

high-performance envelopes, windows, appliances, equipment, optimized designs

Smart

analytics supported by sensing and optimized controls that are necessary to manage multiple behind-the-meter DERs

Connected

ability to send and receive signals that are required to respond to grid's needs

Flexible

energy loads can be dynamically shaped and optimized through behind-the-meter generation, electric vehicles, and energy storage

## COMPONENTS

### Current state of play

- Adoption of EE solutions, DERs, digitalisation and grid interactivity;
- Opportunities and barriers

### Technological solutions

- BEMS, smart sensors and controls, smart meters
- Smart EV charging and storage, DER management

### Policy strategies

- Buildings regulation
- Utilities regulation
- B2G, B2V interactions, P2P energy trading, virtual power plants

- **8<sup>th</sup> Annual Global Conference on Energy Efficiency**  
**Paris, 6-8 June 2023**
- The 7<sup>th</sup> annual conference was held in Denmark, June 2022
- 26 governments issued a joint statement, “calling on all governments, industry, enterprises and stakeholders to strengthen their action on energy efficiency” and welcomed the Sønderborg Action Plan



**Thank you**