

The logo is a right-angled triangle with a purple border. Inside the triangle, the text "SET PLAN" is in bold black, "Conference" is in regular black, and "2015" is in regular black.

**SET
PLAN**
Conference
2015

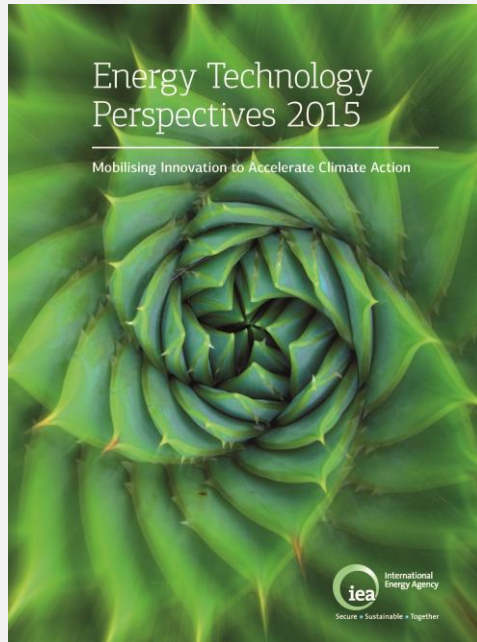
Research, innovation
and competitiveness
for the Energy Union

THE ROLE OF HEATING AND COOLING IN EFFICIENT ENERGY

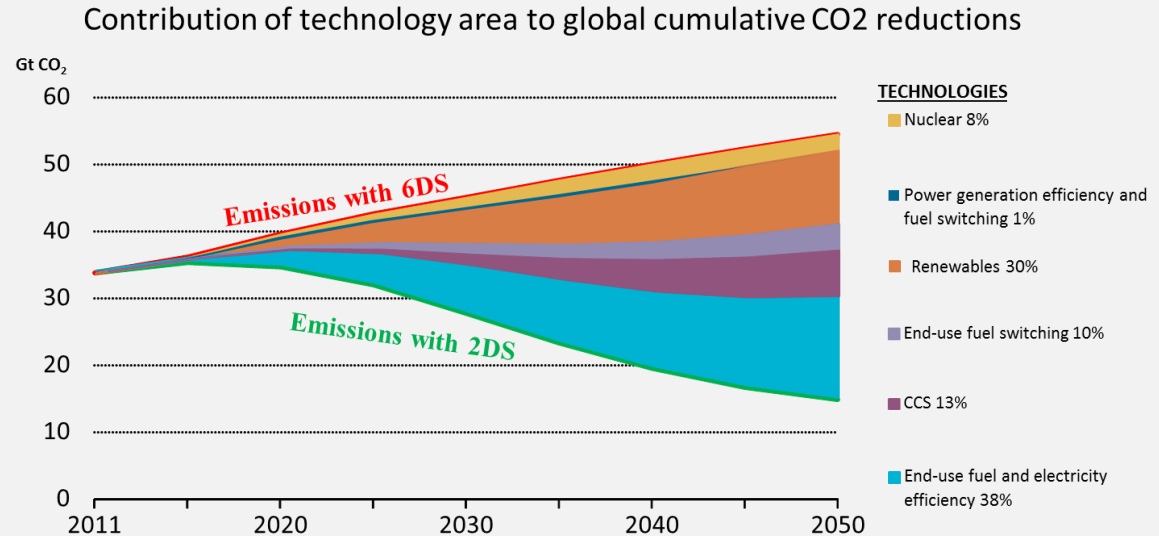
Jean-Francois Gagné, Head of Energy Technology
Policy Division, International Energy Agency

SESSION 5

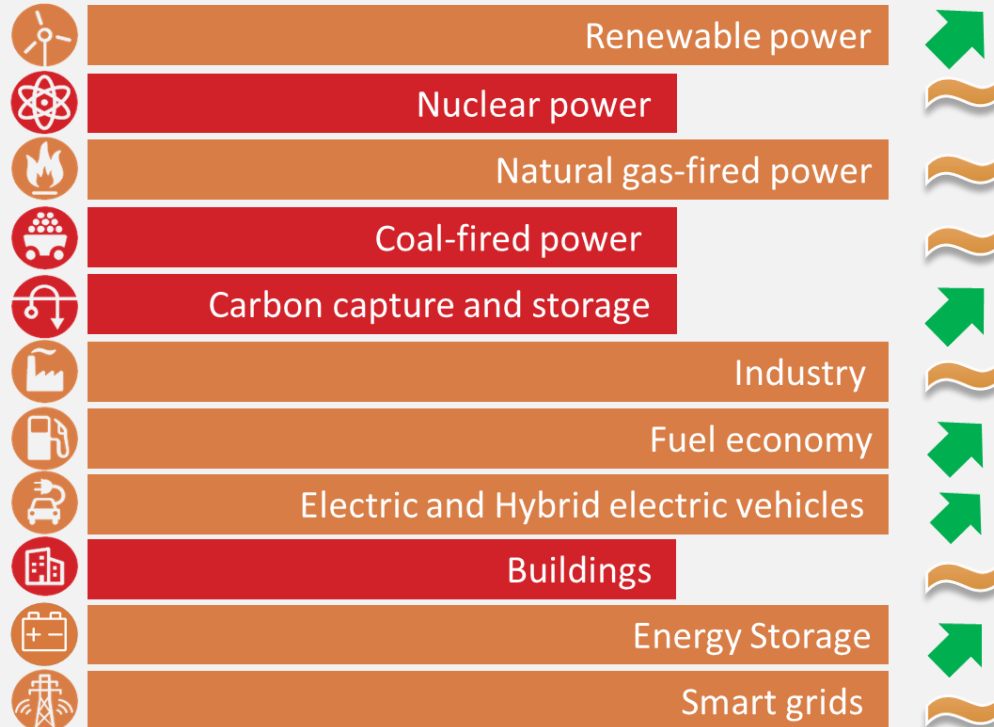
Efficient energy systems
Tuesday 22 September 2015



ENERGY INNOVATION IS CRUCIAL TO A SUSTAINABLE ENERGY TRANSITION

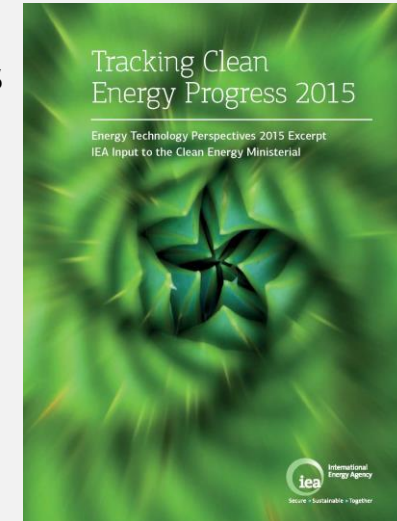


Energy innovation has already yielded solutions, but needs support and guidance to deliver on its promises



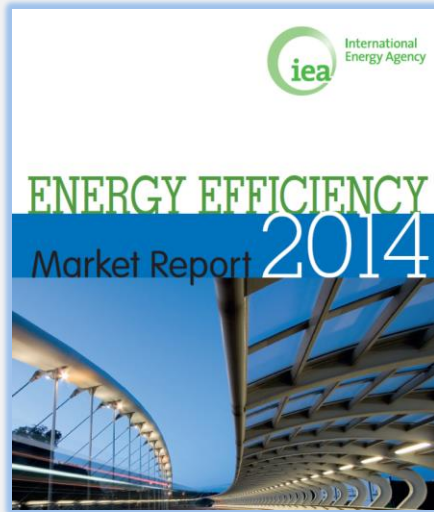
CLEAN ENERGY IS NOT RAMPING UP FAST ENOUGH

- Despite some progress



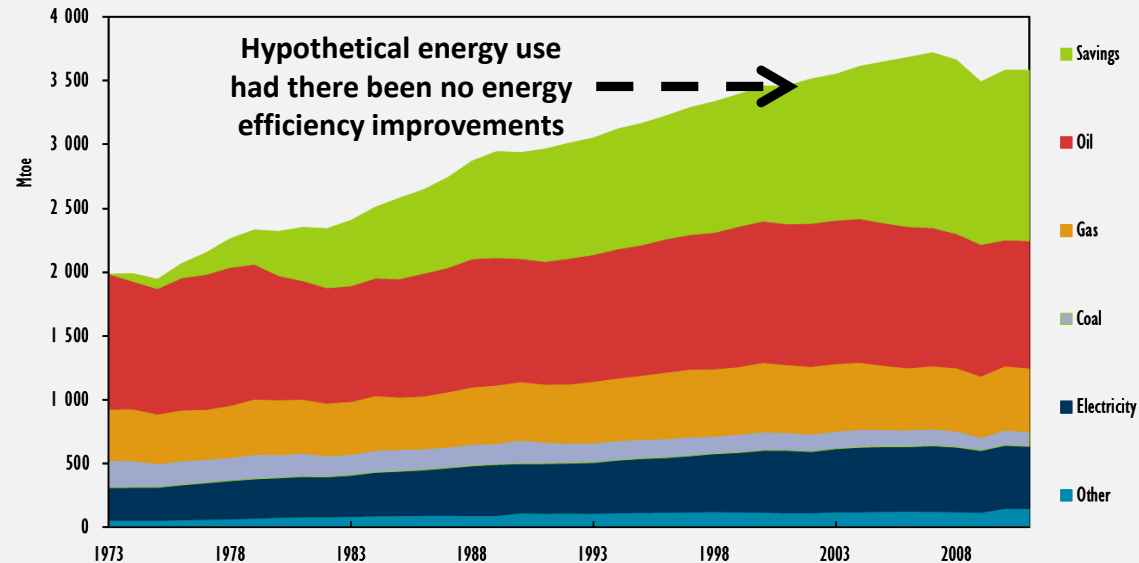
Evidence shows that despite continued progress in many areas, for the first time none of the technologies are in line with 2DS goals

ENERGY EFFICIENCY: A BIG PART OF THE ENERGY LANDSCAPE



*Energy efficiency is the ‘first fuel’:
Energy savings are larger than the contribution
of any other fuel to TFC in 2012*

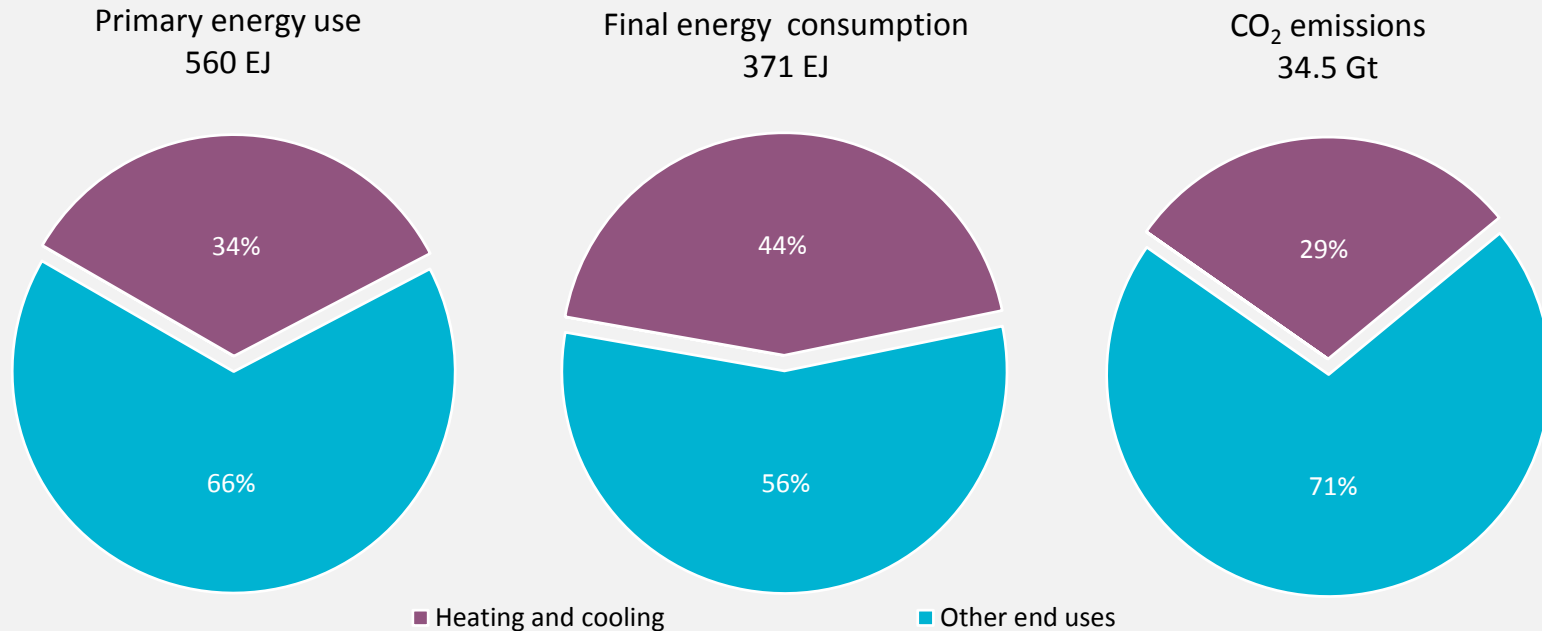
TFC fuels (IEA-11) incl. EE savings



*IEA-11: Australia, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Sweden, United Kingdom, United States

Source: IEA MTEEMR 2014

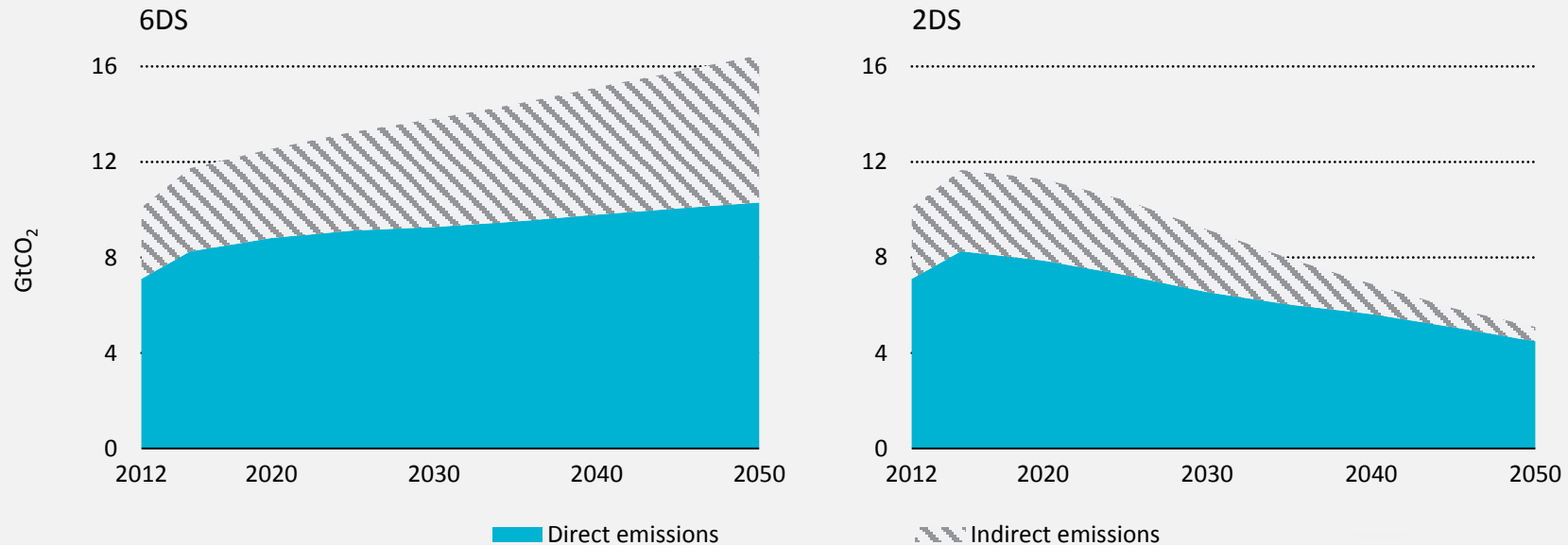
THE IMPORTANCE OF HEATING AND COOLING TODAY



Heating and cooling services account for around 30% of primary energy use and CO₂ emissions globally today.

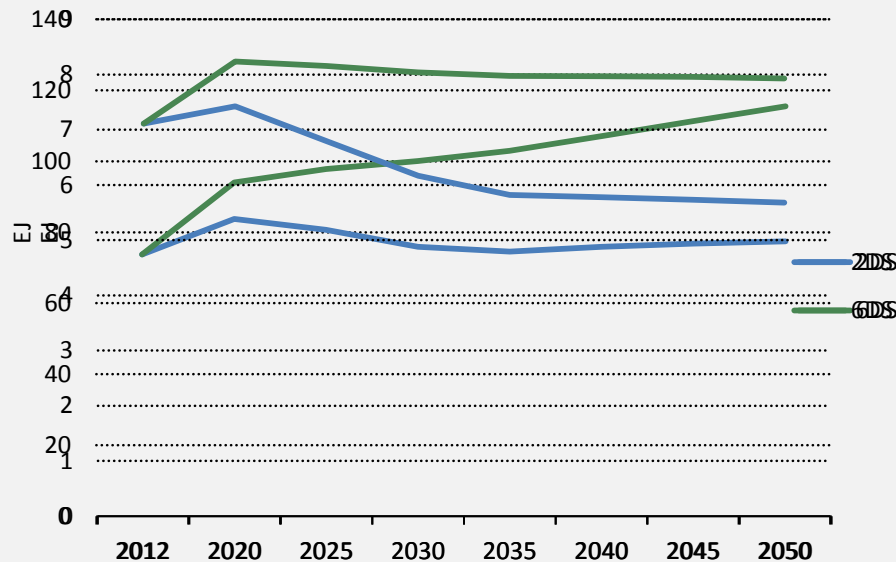
Source: IEA ETP 2015

GLOBAL CO₂ ASSOCIATED WITH HEATING AND COOLING

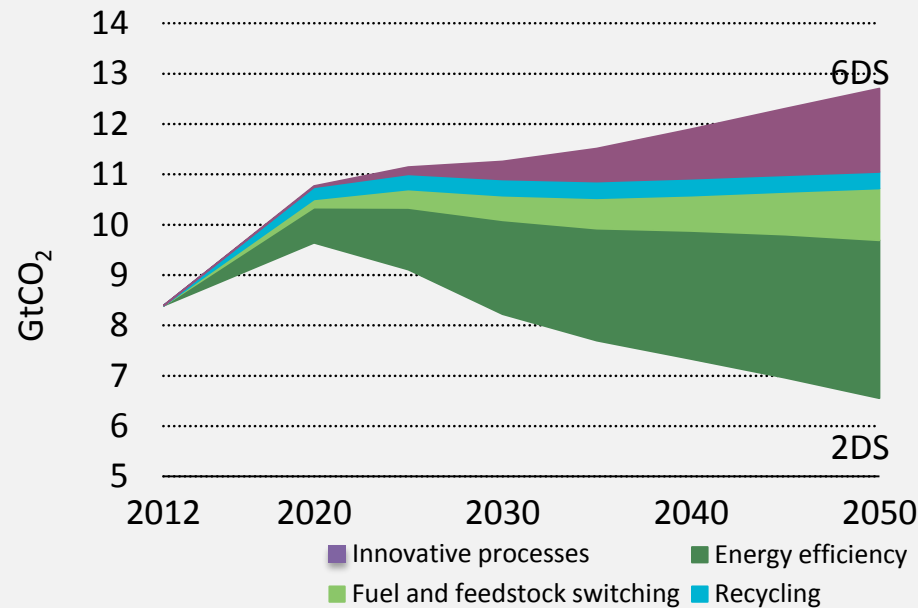


Reductions in indirect emissions, i.e. from electricity and district heating, are crucial, providing around 50% of the reductions between the 2 and 6DS in 2050.

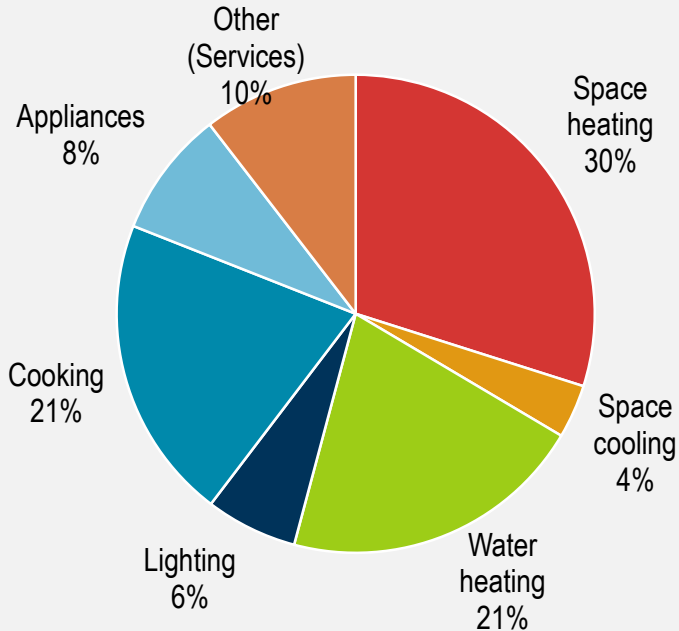
EU28 INDUSTRIAL HEAT DEMAND BY SCENARIO



ANNUAL ENERGY-RELATED DIRECT CO₂ EMISSIONS IN THE INDUSTRIAL SECTOR IN THE 2DS



Global Buildings energy Use

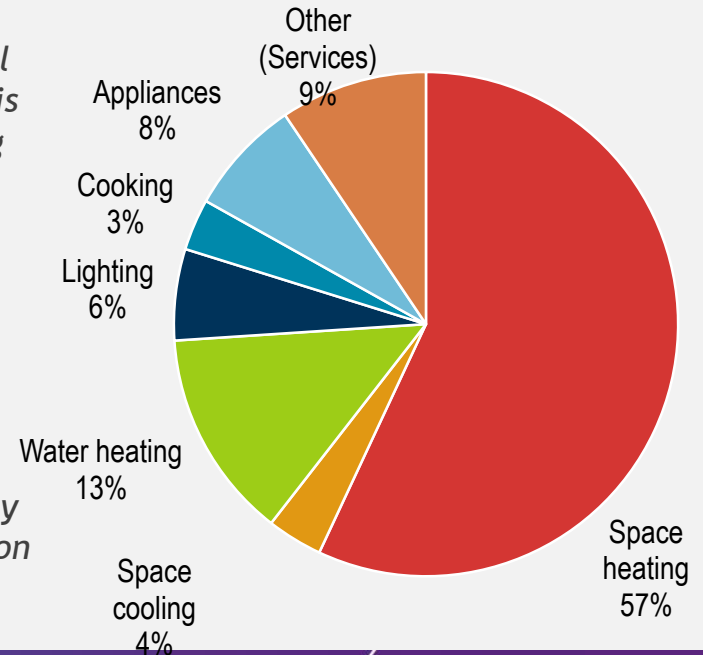


BUILDINGS ENERGY USE (2013)

*More than 50% of global
energy use in buildings is
for heating and cooling needs.*

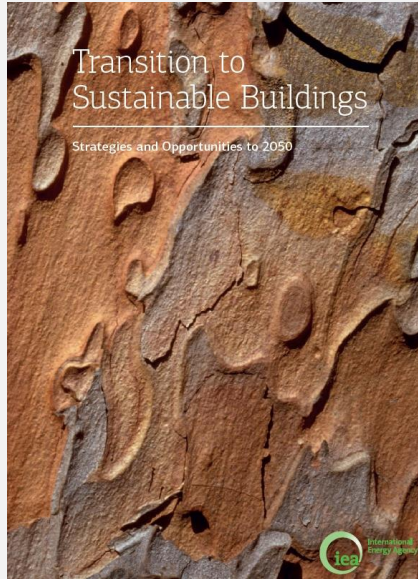
*This trend goes to nearly
75% in the European Union*

EU Buildings energy Use



Source: IEA ETP 2015

ENERGY TECHNOLOGY OPTIONS TO TRANSFORM TO LOW ENERGY BUILDINGS



Inefficient, still-common and old stock

Single pane windows
No insulation
High air leakage

Inefficient gas, oil and coal boilers
Electric resistance heaters
Conventional biomass burning

Typical building code in advanced regions

Low-e double glazed windows
High levels of insulation
Low air leakage

Condensing gas boilers
Electric heat pumps
Modern district heat and biofuels

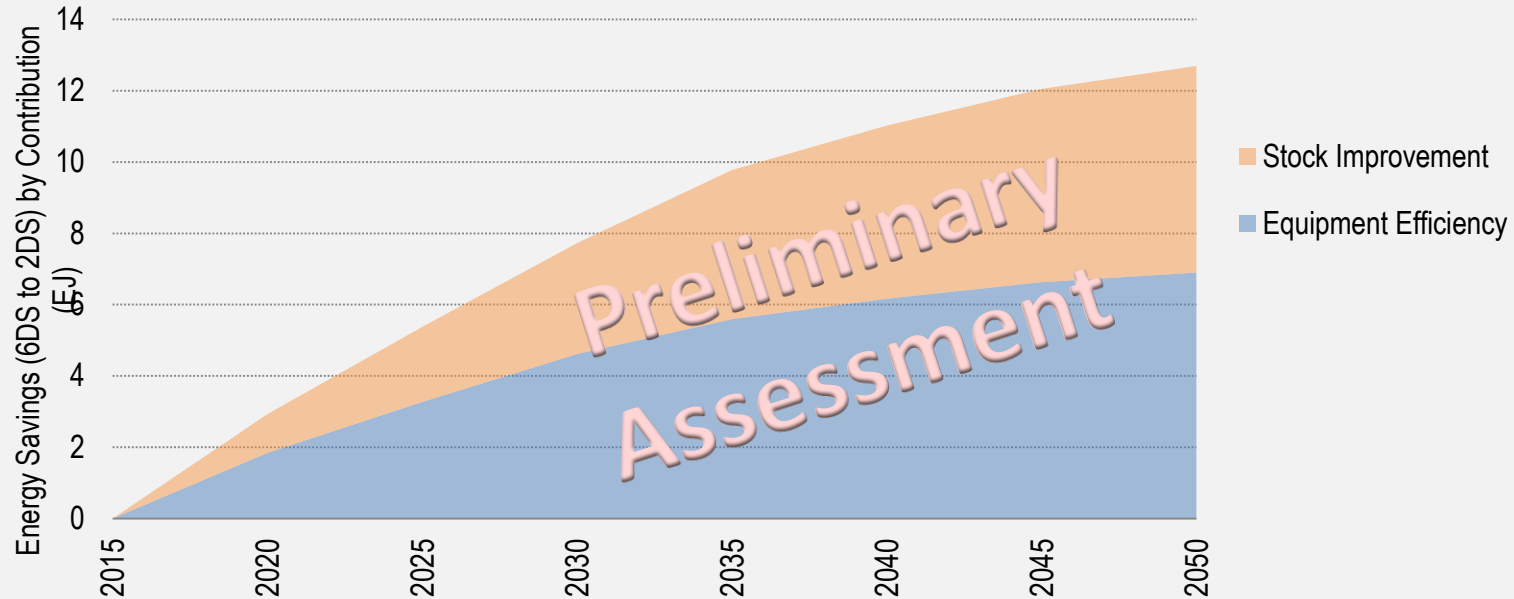
Zero- and low-energy buildings

Highly insulating and variable solar windows
Optimised building design and orientations
Natural ventilation and daylighting

Water heating, cold-climate and gas-
thermal heat pumps
Solar thermal with energy storage
Advanced district heat and micro-CHP

*First step: reduce need for heating and cooling!!
Then: provide heat in a more efficient way*

HEATING LOAD REDUCTION POTENTIAL

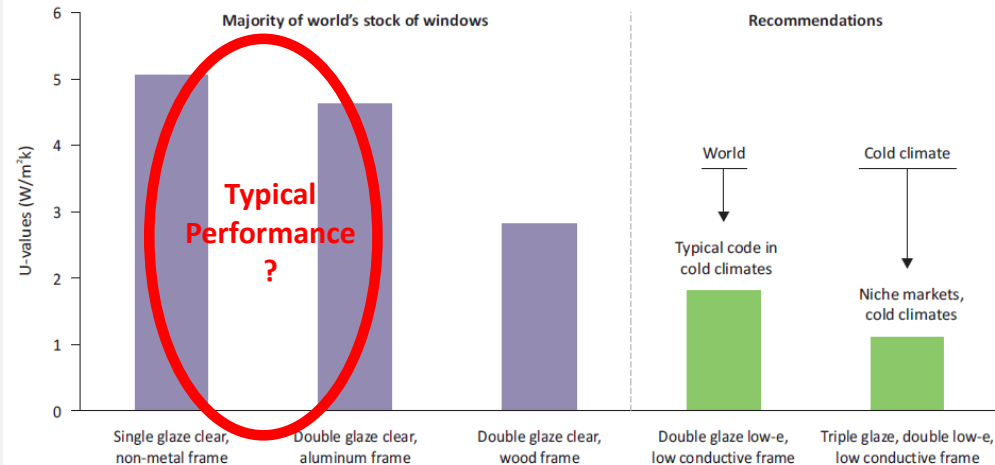


Building envelope technologies and equipment efficiency can significantly reduce thermal energy demand.

BUILDING ENVELOPE TECHNOLOGY OPTIONS



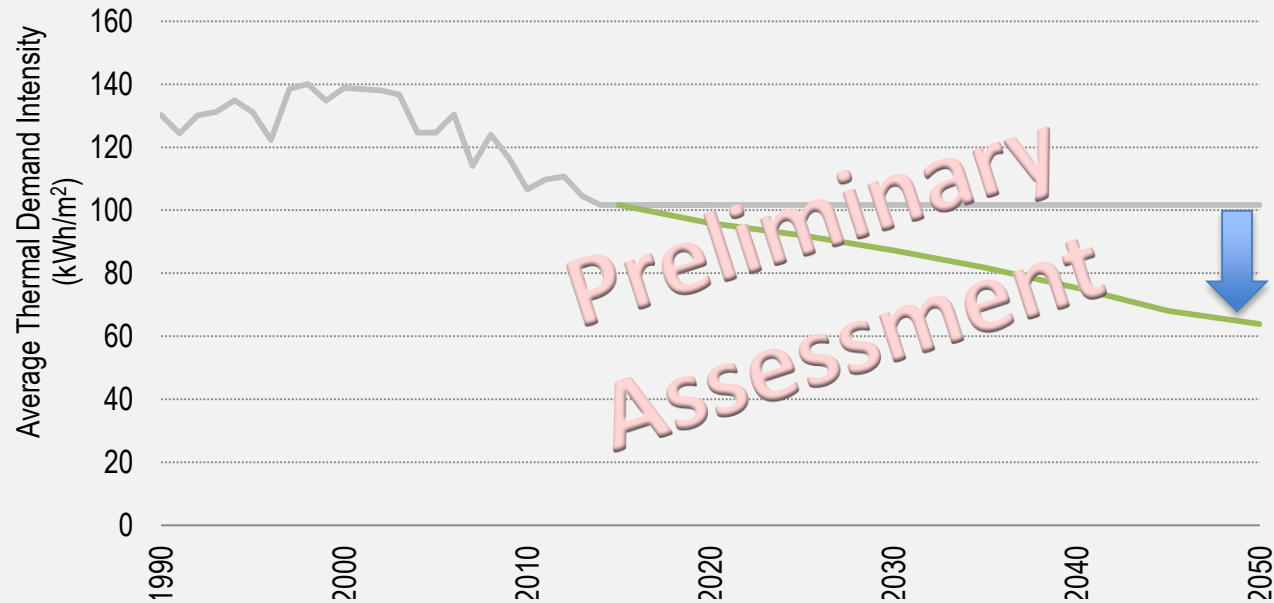
Figure 3: Most common types of windows in service and being sold today



Note: U-values presented in this roadmap represent whole-window performance unless noted in accordance with ISO 15099, thus an ISO 10077 standard of $1.0 \text{ W/m}^2\text{K}$ is roughly equal to $1.1 \text{ W/m}^2\text{K}$ per ISO 15099.

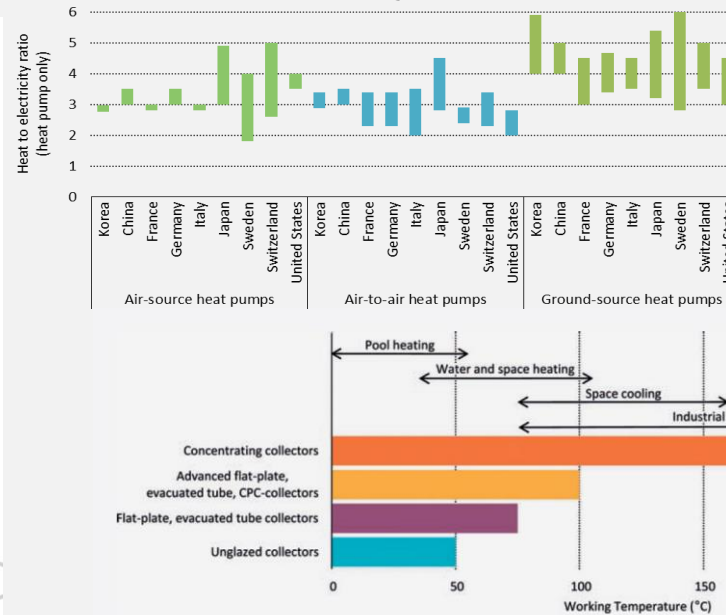
The majority of the world's envelope technologies can be significantly improved and more worked is needed.

HEATING LOAD REDUCTION POTENTIAL

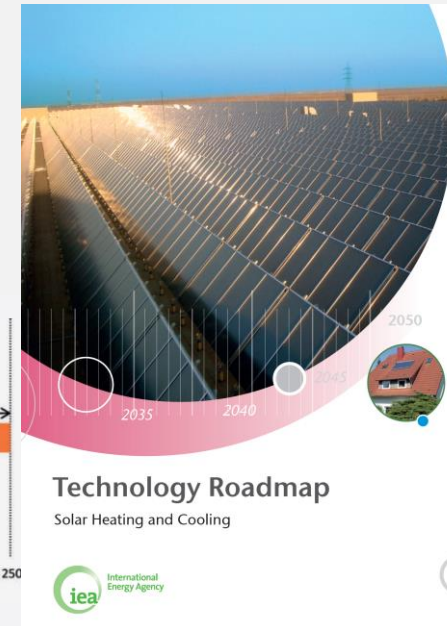


Deep retrofits for existing buildings are critical to meeting 2DS buildings targets.

HEATING AND COOLING EQUIPMENT TECHNOLOGY OPTIONS

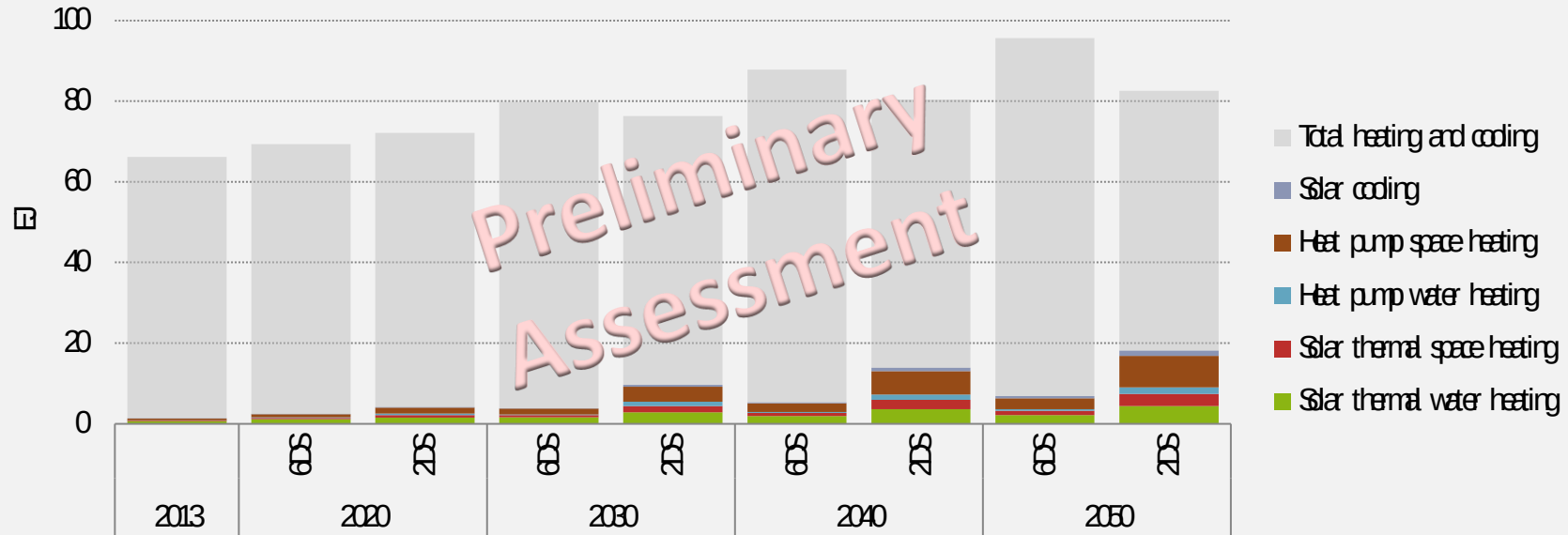


Note: CPC = compound parabolic concentrator.



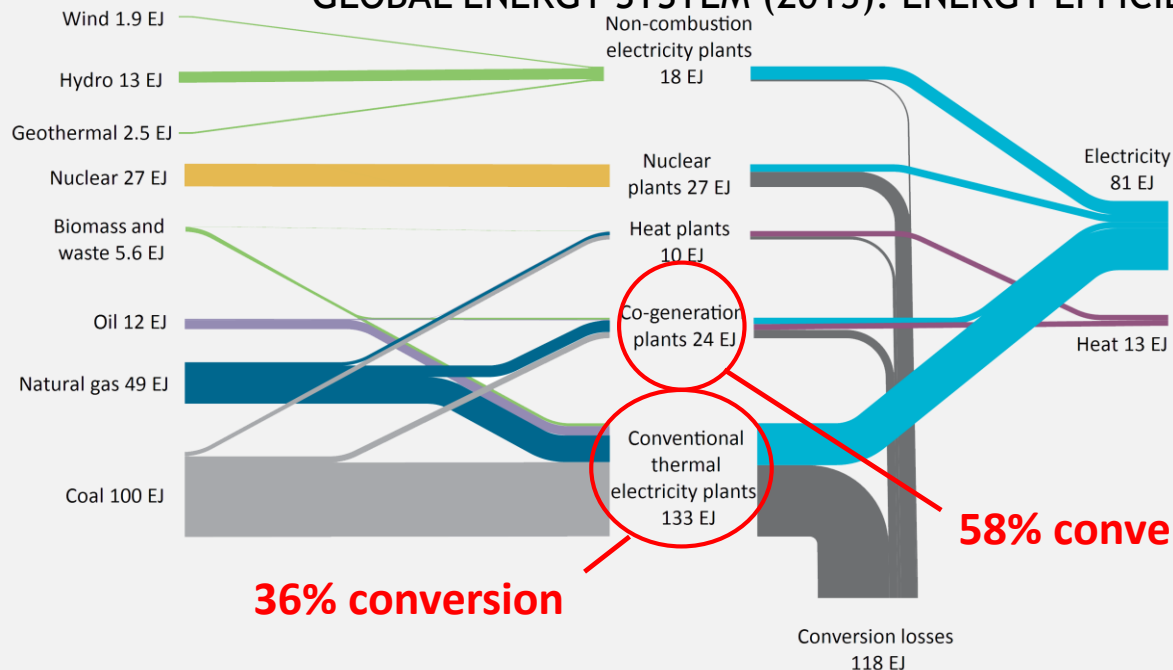
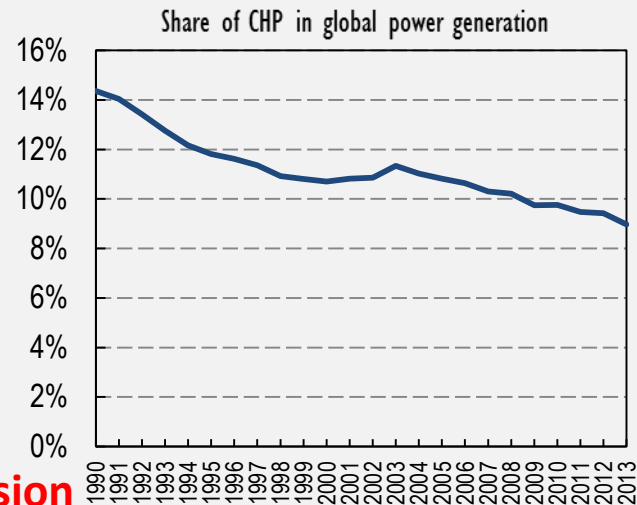
Heat pumps and solar heating and cooling offer large potential to mitigate water and space heating energy demand

HEATING AND COOLING TECHNOLOGY SHARES (FINAL ENERGY)



Highly efficient and renewable technologies play a key role in meeting heating and cooling needs in the 2D5.

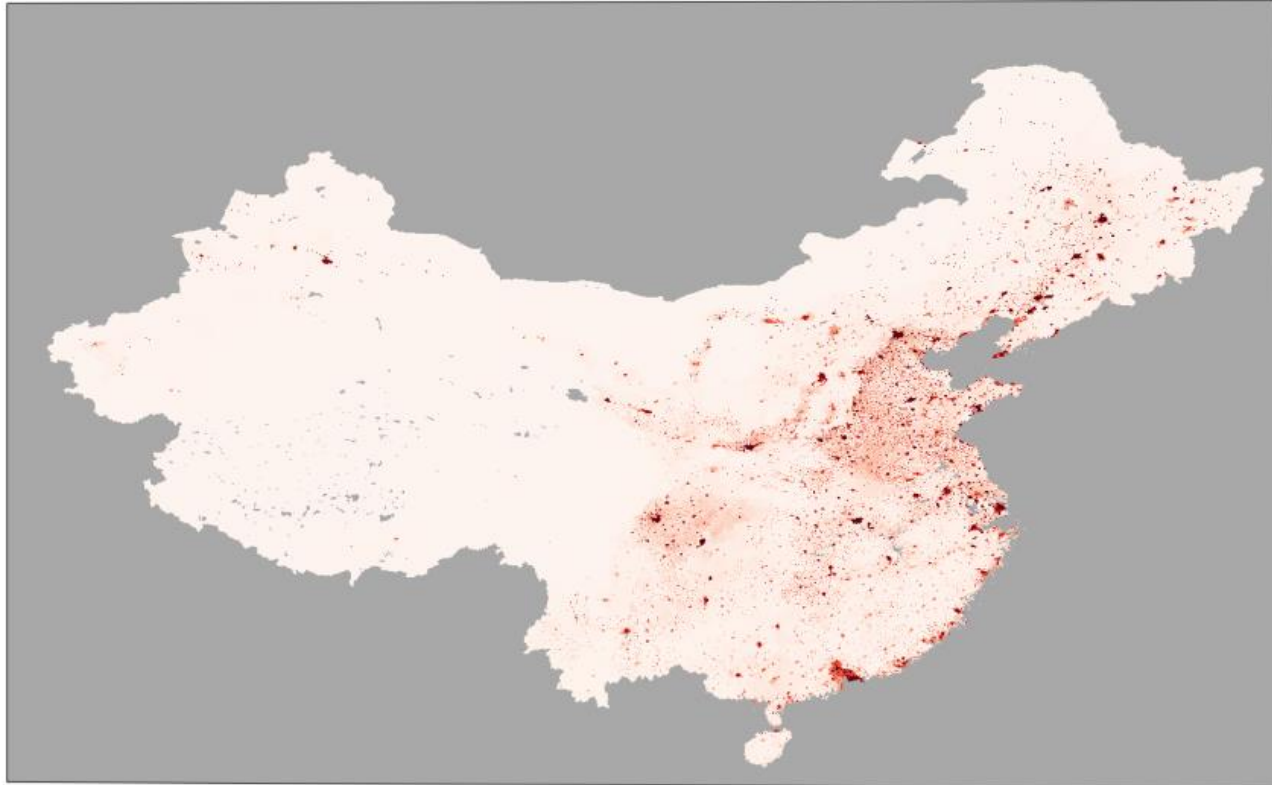
GLOBAL ENERGY SYSTEM (2013): ENERGY EFFICIENCY OPPORTUNITIES



Yet less than 10% of power generation comes from co-generation.

Nearly 2/3 of power generation energy input is lost in conversion processes.

Industrial Final Heat Demand (EJ)

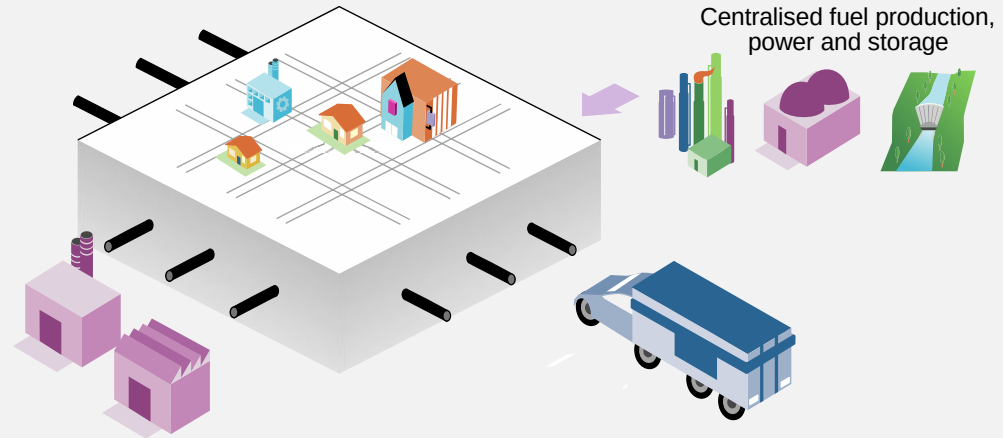


A FOCUS IS NEEDED ON SYSTEMS INTEGRATION INNOVATIONS



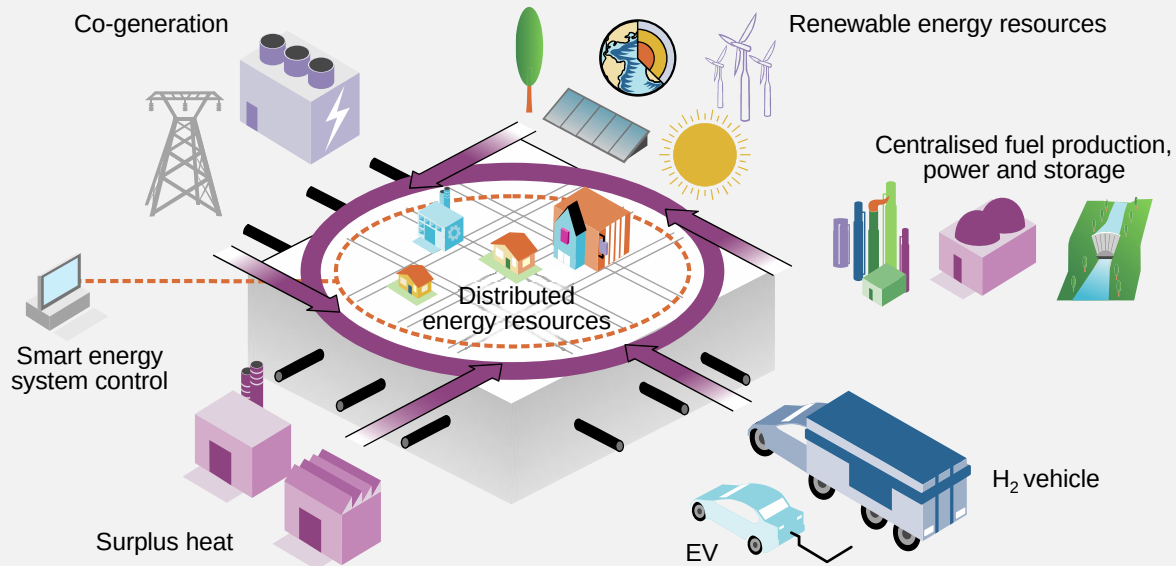
Linking heat and electricity systems can provide both efficiency and flexibility gains

SYSTEMS THINKING AND INTEGRATION



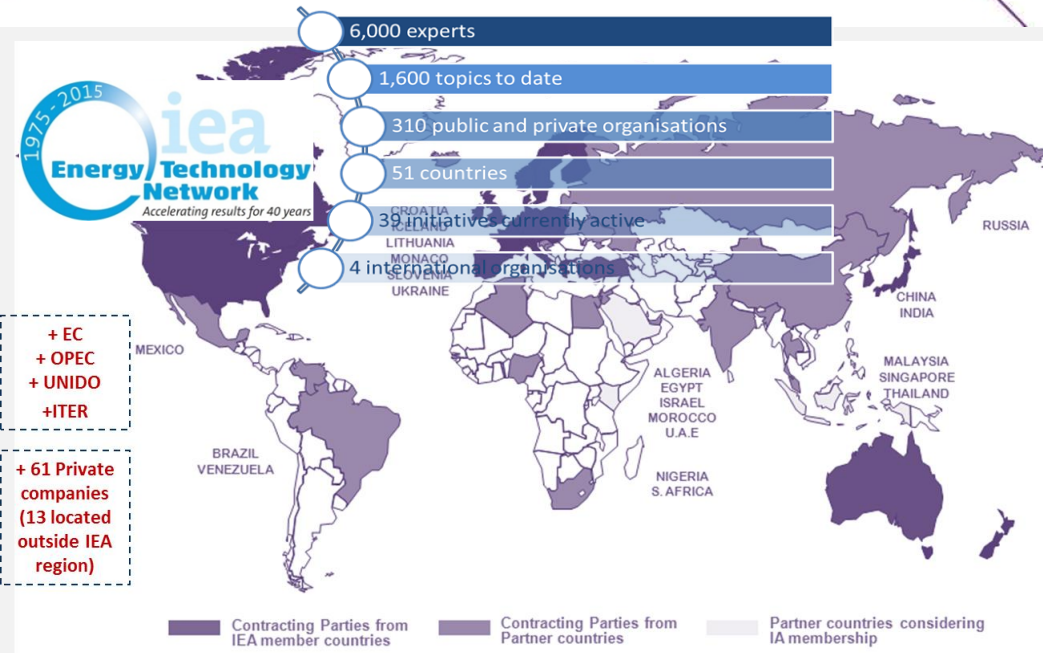
Today's energy system paradigm is based on a unidirectional energy delivery philosophy

SYSTEMS THINKING AND INTEGRATION



A sustainable energy system is a smarter, multidirectional and integrated system that requires long-term planning for services delivery

SET PLAN Conference 2015



Research, innovation and competitiveness
for the Energy Union

THE IEA ENERGY TECHNOLOGY NETWORK



International collaboration is an essential aspect of a strategy to enable energy technology to fulfil its role

Explore the data behind ETP



www.iea.org/etp

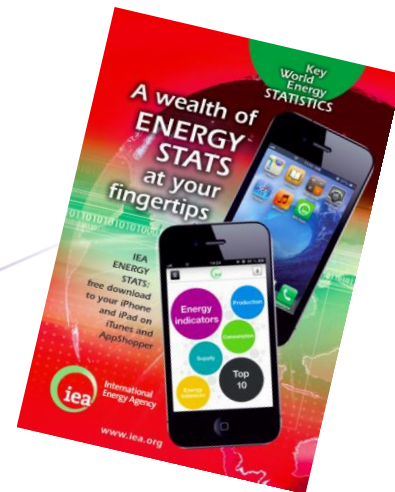


Jean-François Gagné
Head of Energy Technology
Policy Division
International Energy Agency

Jean-Francois.GAGNE@iea.org

THE ROLE OF HEATING AND COOLING IN EFFICIENT ENERGY

SET
PLAN
Conference
2015



myenergy
Luxembourg



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Économie



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère du Développement durable
et des Infrastructures

Département de l'environnement



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère du Logement

With the
support of



Co-funded by
the European Union



Presidency of
the Council of the
European Union

GRAND-DUCHÉ DE
luxembourg

This conference has received funding from the European Union Horizon 2020 research and innovation programme under the grant agreement No 681163