Il ruolo della ricerca per la promozione dell'efficienza energetica

Piero Salatino

Presidente
Scuola Politecnica e delle Scienze di Base
Università degli Studi di Napoli Federico II

neapōlis

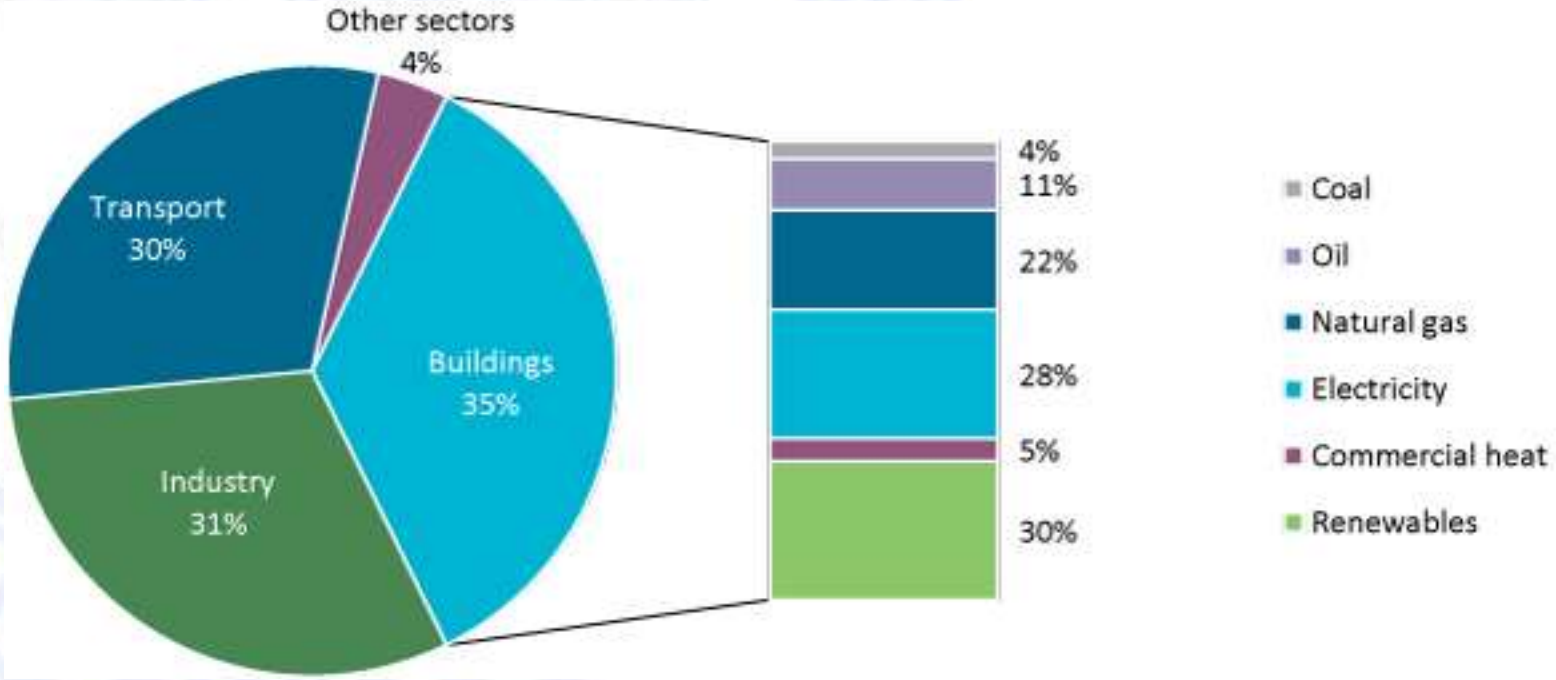
UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
SCUOLA POLITECNICA E DELLE SCIENZE DI BASE

Le condizioni di contesto e le linee di tendenza

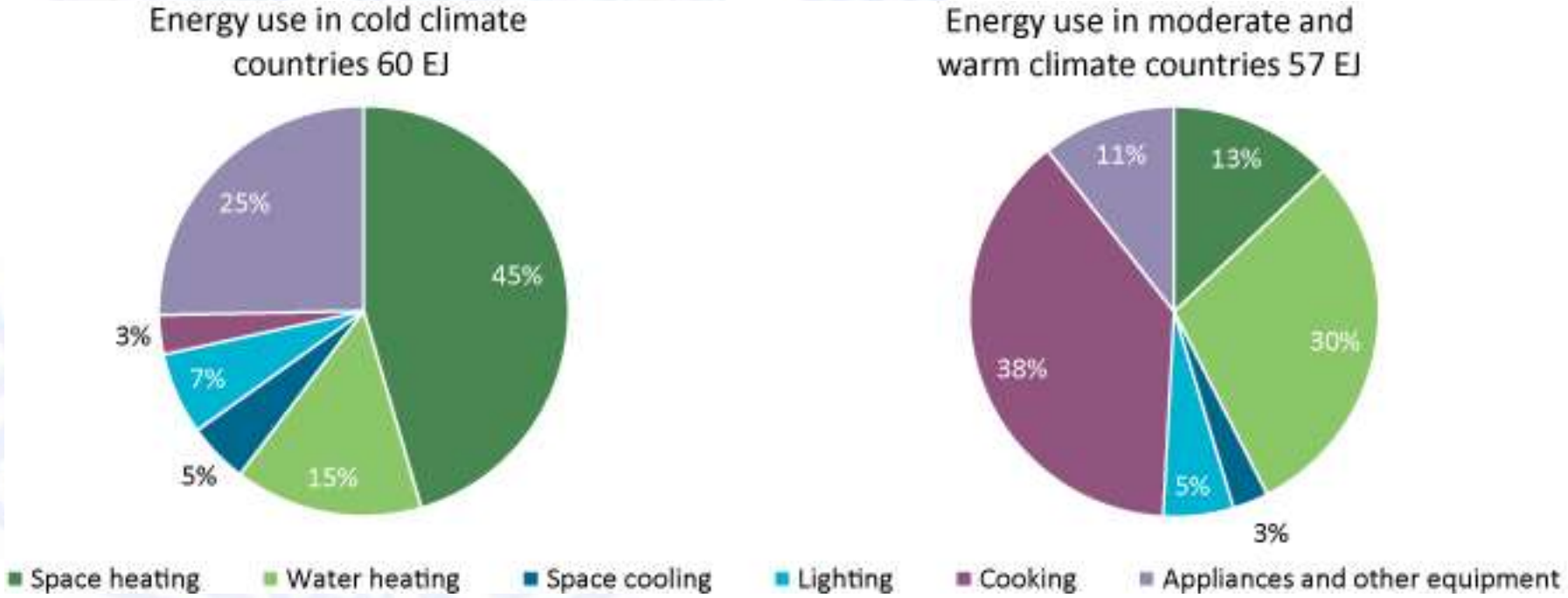
neapōlis

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
SCUOLA POLITECNICA E DELLE SCIENZE DI BASE

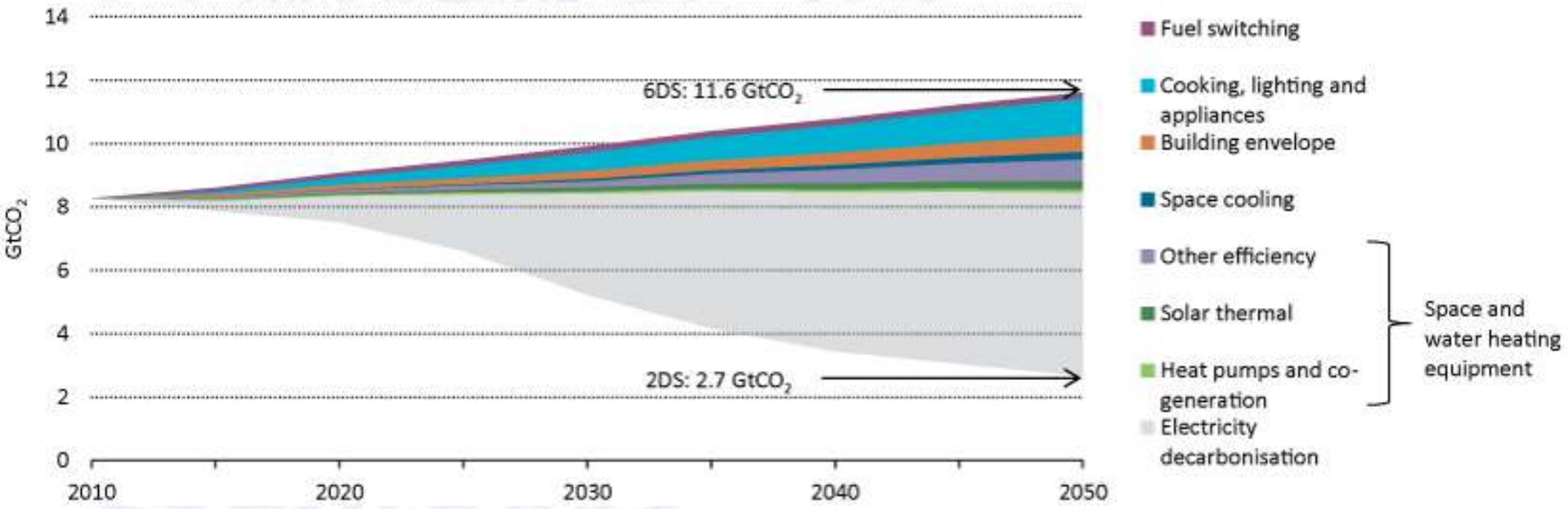
Consumi energetici nel settore dell'edilizia



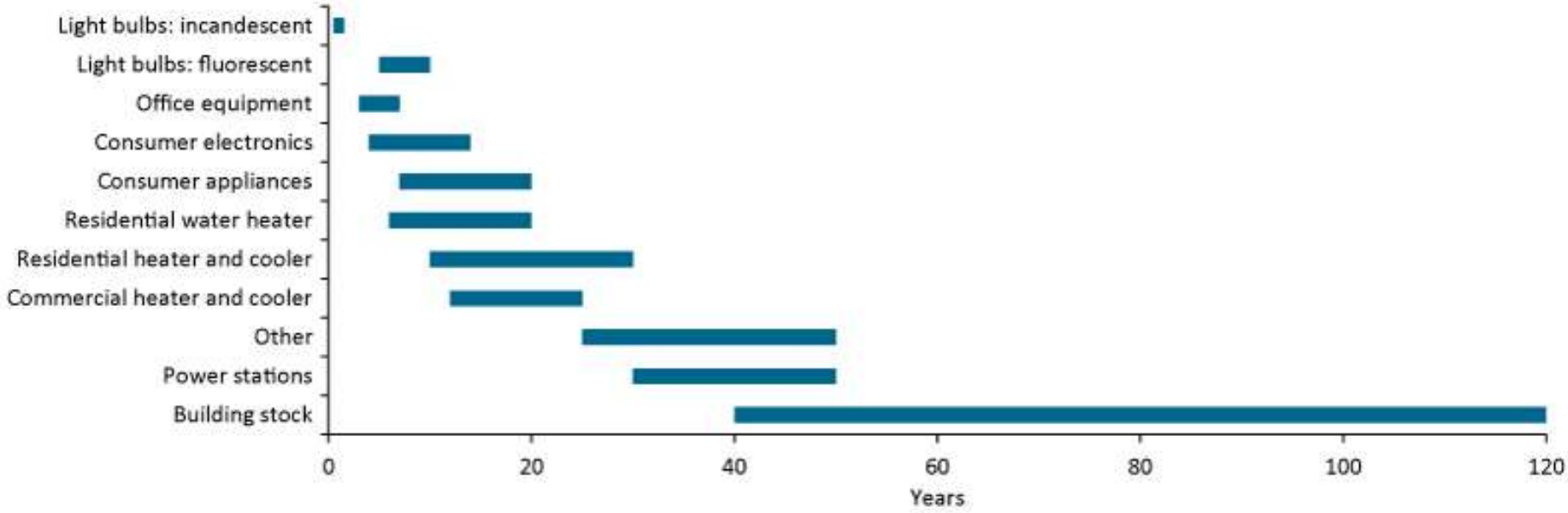
Consumi energetici nel settore dell'edilizia



Consumi energetici ed emissioni di CO_2



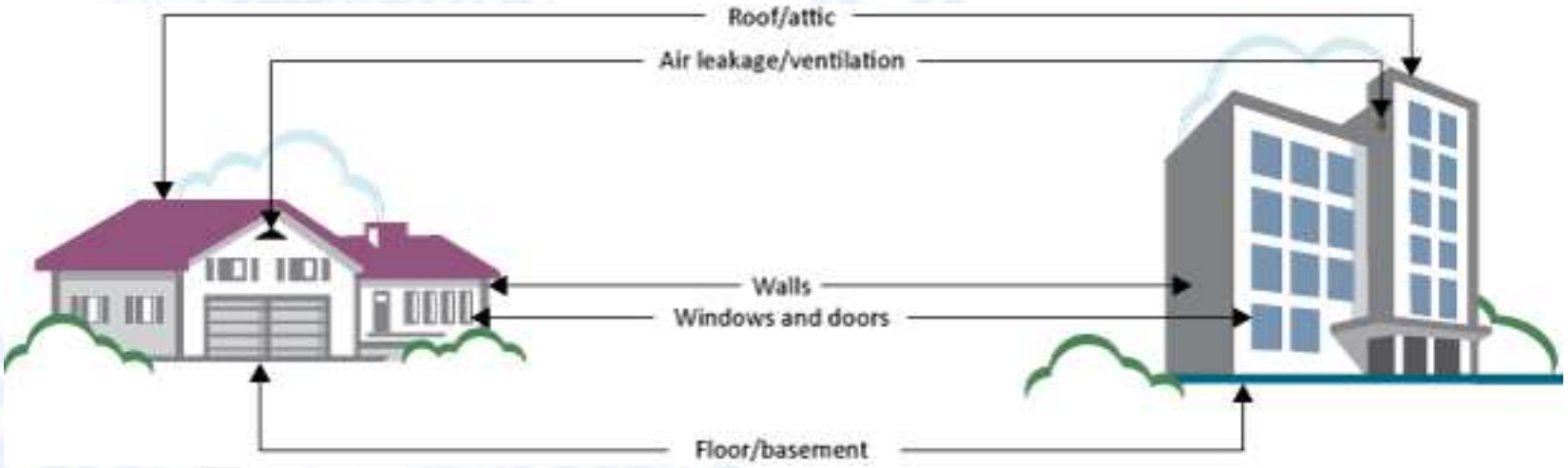
Le scale temporali



Required actions to achieve the 2DS

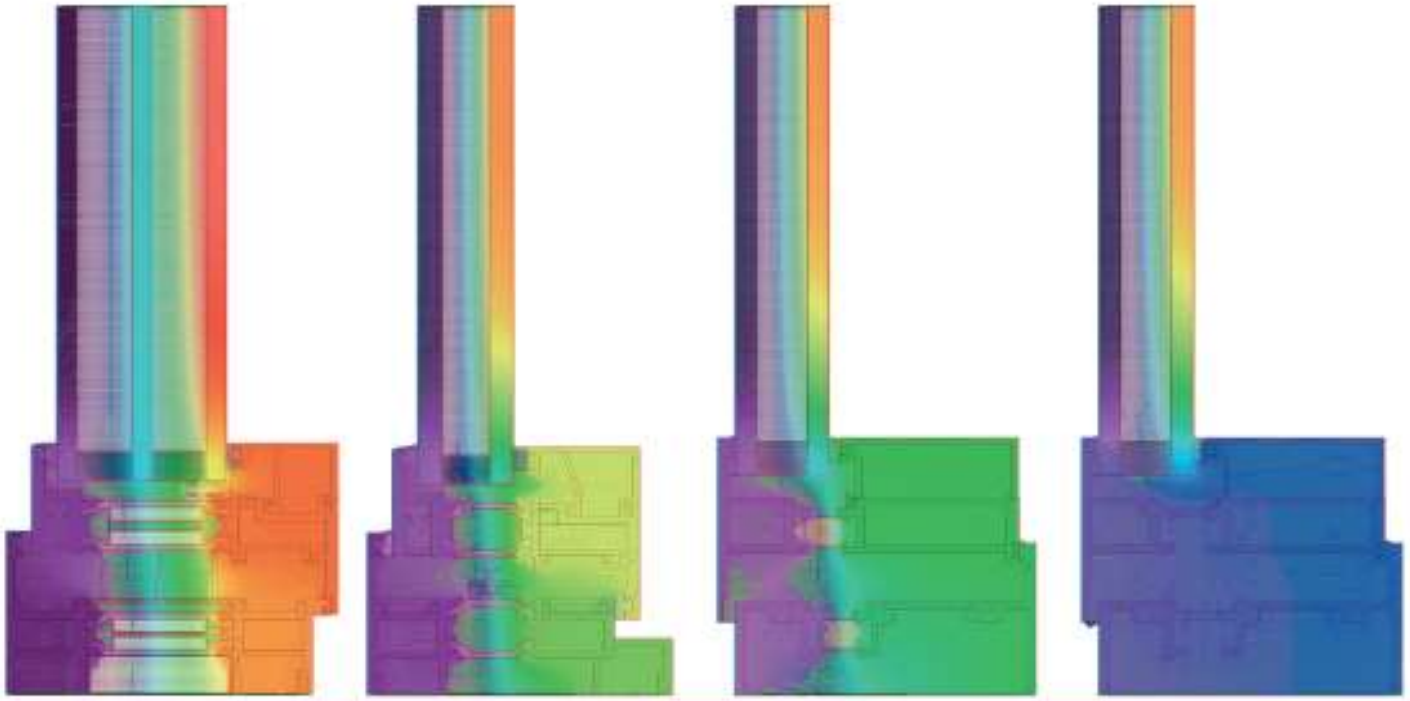
	Policy and technology priorities	
Improvement area	**Immediate recommendations**	**Future requirements**
Building codes are widely implemented in all countries for all new buildings	Regulatory standards for new buildings in cold climates are tightened progressively. In hot climates, cooling loads are reduced by around one-third.	Loads reduced to between 15 kilowatt-hours per square metre per year (kWh/m^2/year) and 30 kWh/m^2/year for heating purposes, with little or no increase in cooling load.
Large-scale refurbishment of residential buildings in OECD countries and non-OECD Europe and Eurasia	R&D on market viablility of deep renovation technologies and services.	Around 90% of today's residential dwellings in OECD countries that will still be standing in 2050 will need to be refurbished to a low-energy standard (approximately 50 kWh/m^2/year), which also enables the downsizing of heating equipment. This represents the refurbishment of around 400 million residential dwellings, facilitated by co-ordinated policy packages.
Increased R&D and deployment of highly efficient heating, cooling and ventilation systems	Higher-efficiency standards for heating and cooling equipment.	Heating systems need to be both efficient and cost effective. Heat pumps with coefficients of performance (COPs) over 3.0 are used in cold climates along with small-scale gas absorption heat pumps with COPs greater than 1.2. Solar thermal has a significant share of water heating and is used for some space conditioning.
Improved lighting efficiency R&D and standards	Regulations to improve efficiency of lighting continue to be implemented.	SSL is widely available as a result of integrated policies.
Improved equipment efficiency is promoted and regulated	Appliance and heating and cooling equipment standards are assumed to shift rapidly to least-cost levels on a life-cycle basis.	Current BAT levels become minimum efficiencies by 2030 in most countries.
Widespread deployment of low- or zero-carbon technologies	Case studies and R&D for more cost-effective applications.	Micro- and mini-co-generation for space and water heating become viable but still are not widely deployed. Co-generation in large buildings becomes more prevalent and represents a modest share of building heat and power with annual system efficiencies greater than 75%.
Cross-sectoral policies and technologies	Modern district heating systems that can benefit from thermal energy storage coupled with waste heat and renewables offer increased system efficiency and flexibility.	Building equipment becomes increasingly integrated into smart grids and smart metering to provide peak-load and economic benefits.

L'involucro



Building envelope recommendations

Technology	Immediate recommendation	Future requirements
New walls	Extend aggressive standards currently in place for very cold climates to moderately cold climates.	Conduct research to make high-performance walls market viable (*e.g.* Passivhaus criteria/VIPs).
Existing walls	Initiate programmes to encourage retrofit to bring walls up to minimum performance levels comparable to moderately cold current building code standards.	Conduct research to bring existing walls up to very high levels of performance.
Roofs	Optimal attic insulation with air sealing, cool roofs in hot climates.	Explore advanced research to bring levels of performance up to best available.
Windows	Mandatory performance levels in cold climates equal to triple glazed performance, and low SHGC in hot climates, low-e windows mandated everywhere, promote retrofit window attachments.	Develop high-performance windows (U-value of 0.6 W/m^2K or lower) and dynamic windows.
New foundations	Enforce mandatory codes.	Find more affordable solutions.
Existing foundations	Find market-viable retrofit solutions.	Find more affordable solutions especially for interior applications.
Air sealing	Implement market-validated air-sealing requirements for new construction and apply to retrofits.	Find more cost-effective approaches and promote to less sophisticated markets.
Building material standards	Harmonise window ISO standards.	Develop harmonised ISO standards for new materials such as cool roofs, PCM, advanced insulation, etc.



	Advanced	High performance	Traditional thermally broken	Non-thermally broken
Window U-factor (0.6mX1.5m) W/m²K	1.1	2.4	3.1	4.6
Frame U-factor W/m²K	2.0	3.5	4.8	7.8
Average interior frame temperature °C	13.5	8.7	4.1	-5.7
Market entry	2010's	2000's	1970's	1930's
Technology detail	▪ Wider thermal break, 40 mm ▪ Advance cavity interruption ▪ Foam filling ▪ Optimised design	▪ Strip thermal break (24 mm wide) ▪ Cavity interruption	▪ Pour and debridge (fill and debridge) thermal break – 6 mm wide	▪ No thermal break

Vetrature dinamiche

Sistema di vetratura elettrocromica a larga scala

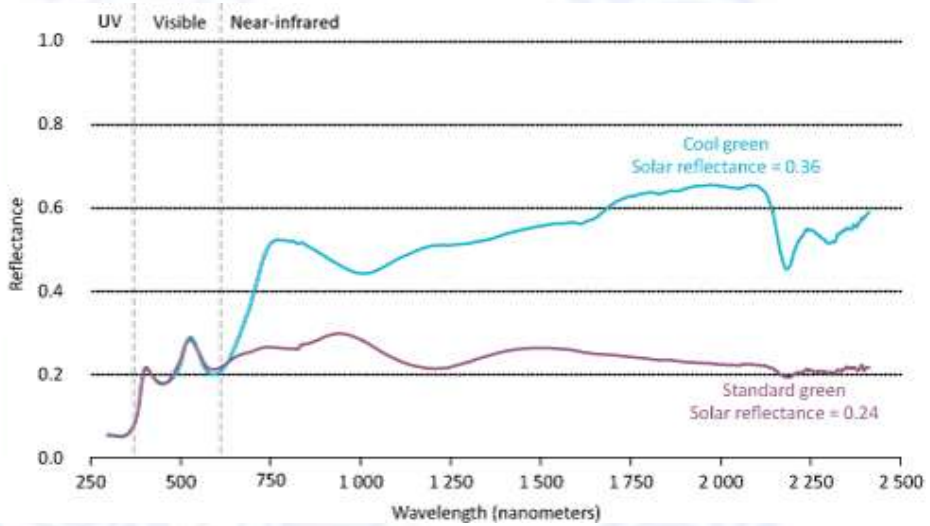
Coperture ad elevata tecnologia

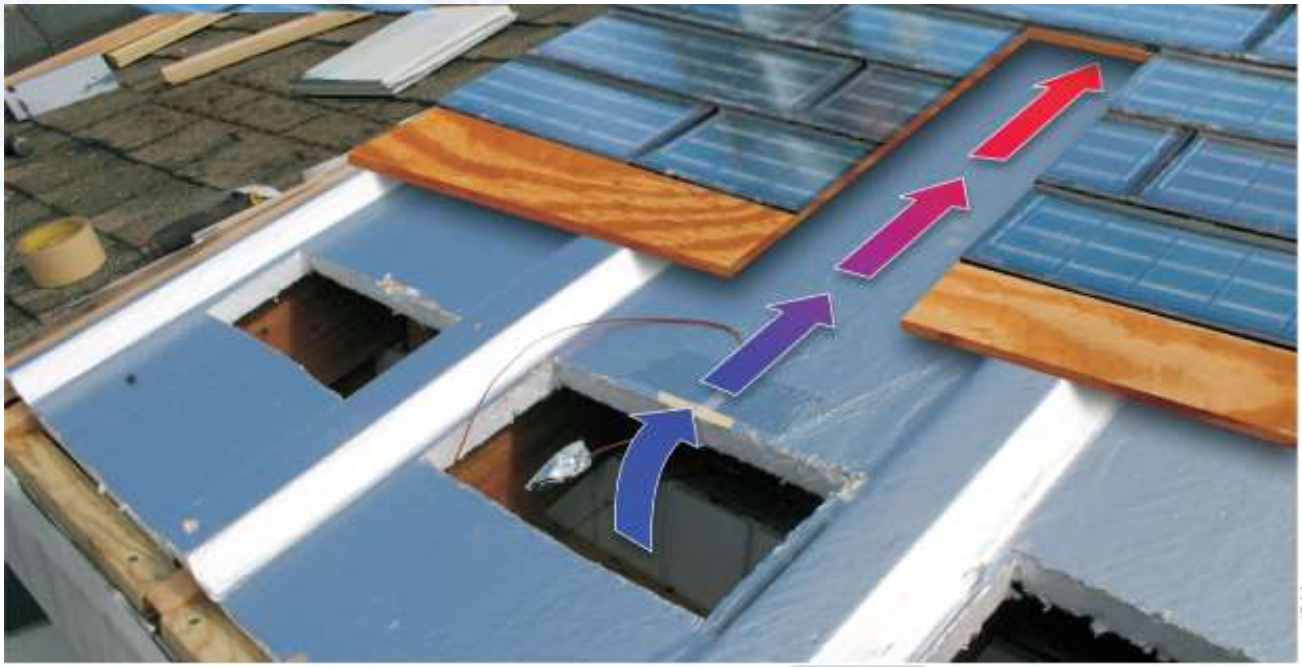
Cool

Solar reflectance = 0.36
Thermal emittance = 0.85
Roof temp – air temp = 31°C

Standard

Solar reflectance = 0.24
Thermal emittance = 0.85
Roof temp – air temp = 38°C





Riscaldamento e raffrescamento

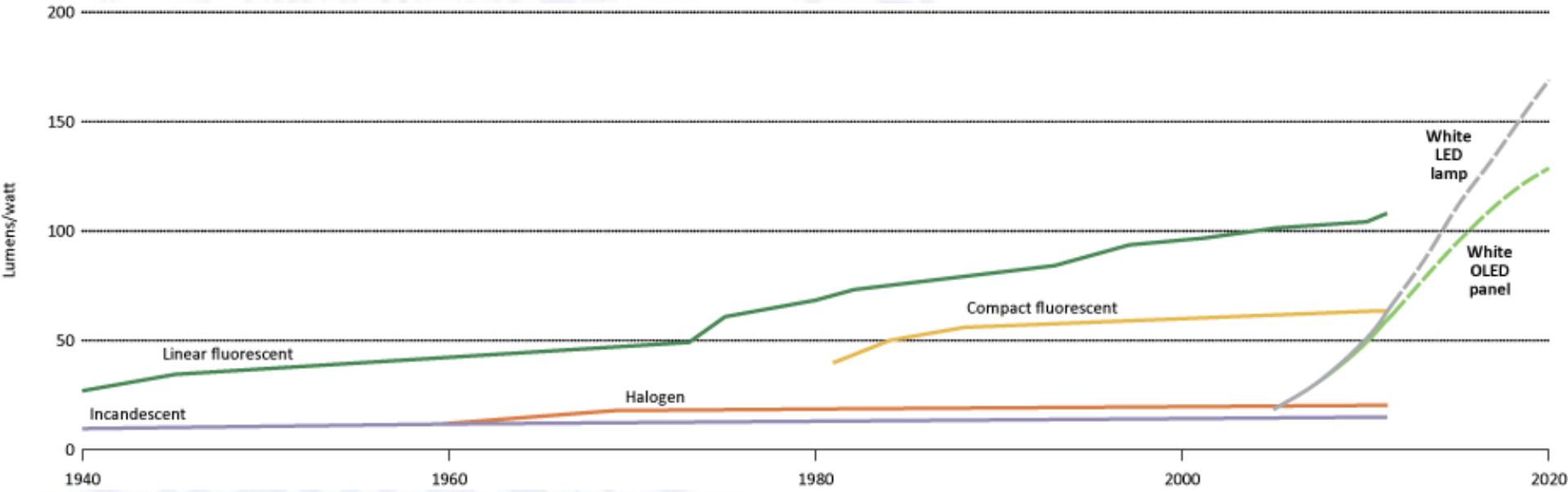
neapōlis

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
SCUOLA POLITECNICA E DELLE SCIENZE DI BASE

Heating and cooling recommendations

Technology	Immediate recommendations	Future requirements
Electric resistance space heaters	Prevent sale for primary heating sources, promote/ regulate heat pumps.	Advanced heat pumps, cold climate heat pumps and solar thermal technologies.
Electric resistance water heaters	Prevent sale, promote/ regulate solar thermal, heat pump water heaters.	Low-cost integrated space conditioning heat pumps and solar thermal technologies.
Gas boilers and furnaces	Upgrade required standards for condensing boilers to ~95% efficiency or higher.	Invest in gas heat pumps with COPs of 1.2 or higher; micro-co-generation in the future.
Gas water heaters	Promote/regulate standards for condensing water heaters and promote instantaneous condensing water heaters.	Combine function with gas heat pumps and TES systems to increase system performance.
Conventional biomass for space and water heating	Promote low-cost, high-efficiency fireplaces and stoves.	Shift to low-cost solar thermal and modern, clean forms of energy. Better use of biomass in central systems.
Air conditioners	Implement minimum efficiency standard programmes.	Develop higher-performing cost-effective products.

Illuminazione e "appliances"



Lighting, cooking and appliances recommendations

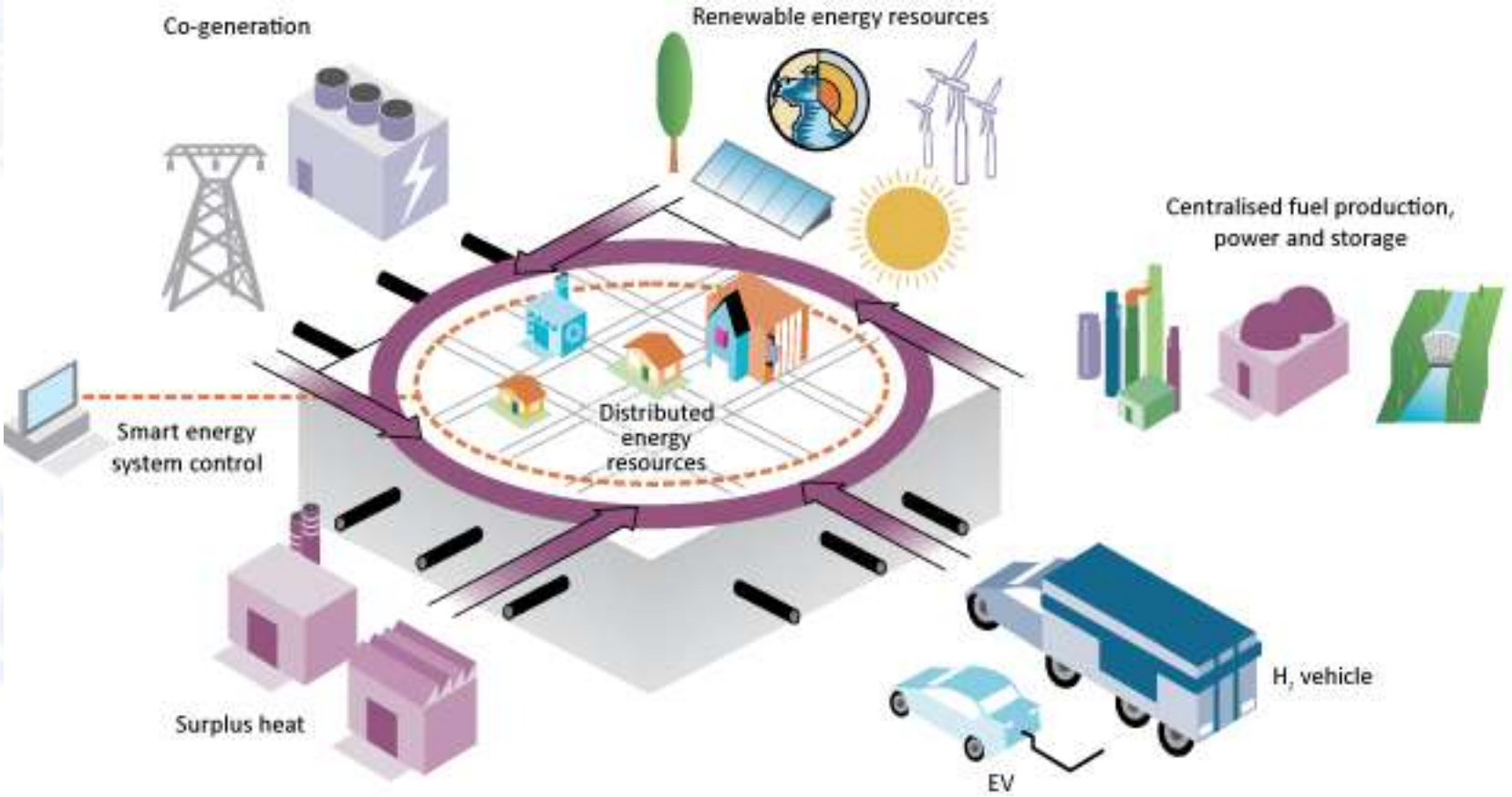
Technology	Immediate recommendation	Future requirements
Biomass cooking	Move to modern cook stoves with affordable options that are regionally acceptable.	Progression to modern forms of energy.
Appliances	Continue and increase effort for standards and labelling.	R&D to find more efficient solutions; develop performance specifications and standards consistent with new technology.
New construction lighting	Add low power-intensity lighting requirements to all building codes and promote natural daylight with solar control to reduce heat gain.	Develop integrated advanced daylighting and SSL solutions.
Existing lighting	Add requirements to renovation programmes to install viable controls and sensor technology; replace all incandescent fixtures with fluorescent or SSL.	Develop solutions for problematic fixture types, where current solutions are unacceptable to consumers or cost prohibitive to replace.
Electronics	Continue standards and labelling programmes and extend around the world.	Develop performance specifications that can stay ahead of, or at least be consistent with, fast R&D field.

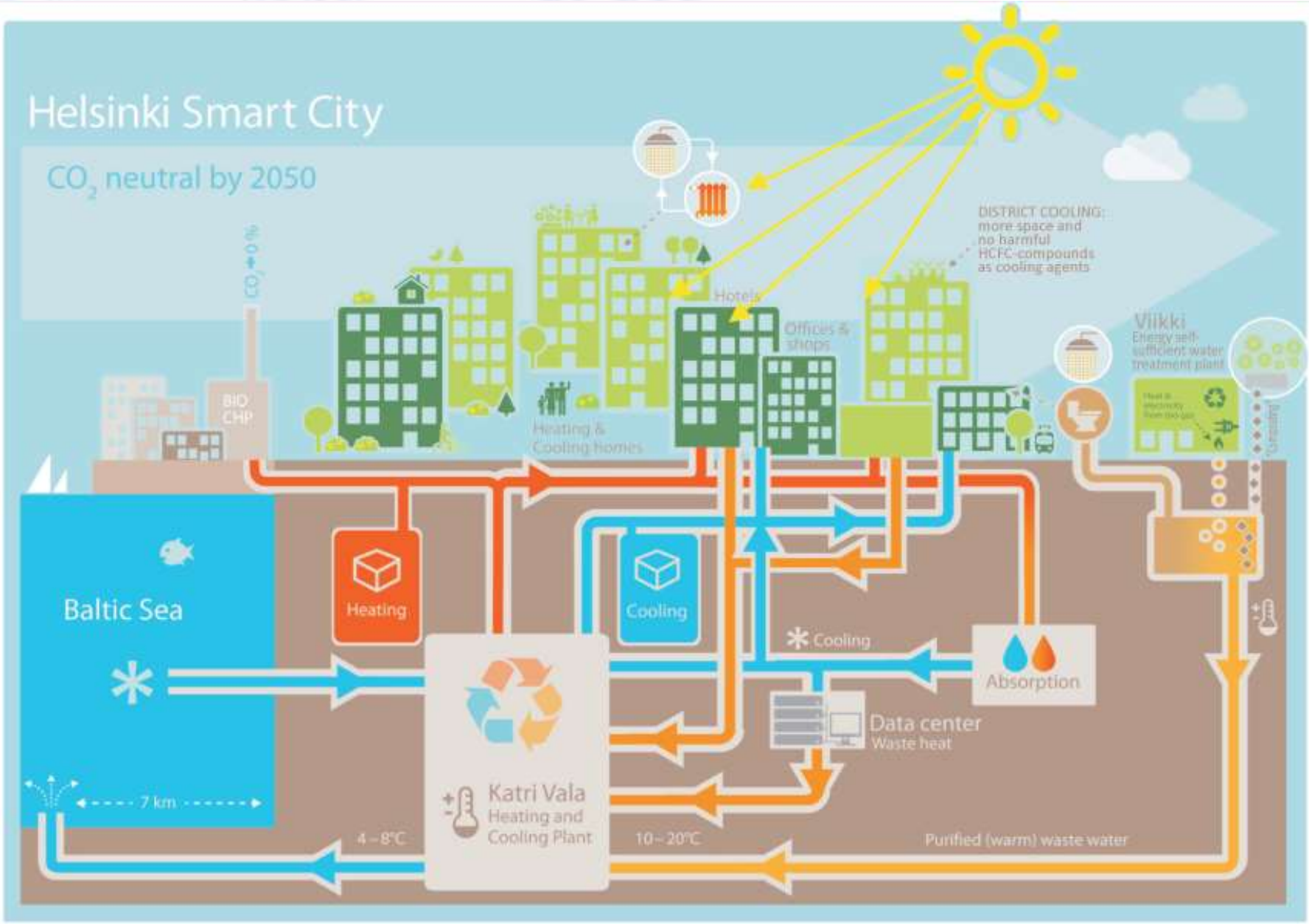
Motori

Integrazione, integrazione, integrazione!

neapōlis

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
SCUOLA POLITECNICA E DELLE SCIENZE DI BASE


Co-generation
Renewable energy resources
Centralised fuel production, power and storage
Smart energy system control
Distributed energy resources
Surplus heat
H, vehicle
EV


Helsinki Smart City
CO_2 neutral by 2050
DISTRICT COOLING:
more space and
no harmful
HCFC-compounds
as cooling agents
Hotels
Offices &
shops
Viikki
Energy self-
sufficient water
treatment plant
BIO
CHP
Heating &
Cooling homes
Baltic Sea
Heating
Cooling
Cooling
Absorption
Data center
Waste heat
7 km
Katri Vala
Heating and
Cooling Plant
4 – 8°C
10 – 20°C
Purified (warm) waste water

Gli attori della ricerca e del trasferimento tecnologico: i Distretti tecnologici

neapōlis

UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II
SCUOLA POLITECNICA E DELLE SCIENZE DI BASE