

ROADMAP FOR A TRANSFORMATION OF ENERGY USE IN BUILDINGS

Actor	Levels	Short-term milestones	Medium term milestones	2050 Objective		
Government authorities	Control & regulatory instruments	Building energy codes	- Introduce mandatory codes in new and existing buildings - Tighten requirements over time	- Codes to request zero net energy for new buildings	Building energy codes for new and existing buildings are stringent and enforced	
		Applied standards	- Expand scope of appliance standards & labeling to cover all equipment - Develop standards to enable communication between appliance energy data and utilities	- Introduce and tighten requirements on energy performance over time	- Appliance energy use is minimized - Standards are stringent and enforced - Information flows between utilities and appliances	
	Economic & market-based instruments	Energy performance labeling & measurement	- Create labeling regulation (e.g. EU Energy Performance Certificates) - Define and enforce common energy use measurement system that include kWh/m ² /year, total kWh and kWh/person/year	- Mandate energy label in every country - Develop "control and tick" measure based on label buildings based on label and actual energy use	- Labels set conditions for subsidies and other benefits or constraints	
		Energy performance audits	- Introduce energy performance inspections into health & safety procedure for existing commercial buildings - Building inspections & carry out labeling of existing buildings - Introduce energy audits for new buildings (like structural checks)	- Carry out regular inspections in commercial buildings - Carry out energy audit of all existing buildings	- All buildings have been audited - Regular audits are mandatory - Energy audits are recognized and accurate	
	Support, information & voluntary action	Metering	- Mandate residential metering and controls in multi-unit residential buildings, offices & retail developments (e.g. vary density depending on building energy performance)	- Inspect metering and controls compliance	- All residential and commercial units have individual metering and controls	
		Procurement regulation	- Create empowered body to remove legal constraints that would hamper energy retrofits (building lines for insulation, etc.) - Create mechanisms to reward utilities for end-user energy savings	- Ensure that energy efficiency is a key consideration in all purchases by the government	- Not applicable if proposed codes and regulations are enforced	
	Developers	Fiscal instruments & Incentives	Urban planning	- Set targets on real estate portfolio based on energy performance for pension funds and other large investors and property owners	- Tighten target over time - Control target compliance	- Legal barriers to energy efficiency are removed in their business model
			Capital subsidies, grants, subsidized loans, loans etc.	- Introduce direct subsidies on first cost only for holistic retrofit packages - Grant tax exemptions based on a building's energy performance - Introduce renewable energy solutions for communities - Incentivize best available technologies to promote innovation and performance	- Subsidize zero net energy new buildings - Introduce a price of carbon as a mean to fund subsidies of energy efficient new buildings - Use sustained price signals on energy to increase the amount of financially justified efficiency investments	- Financial support / penalties are linked to actual energy performance and improvements - Poor performing buildings are replaced by new zero net energy buildings
		Support, information & voluntary action	Research & development	- Standardize R&D programs for new designs, technologies & materials for energy savings & support the transition from late-stage R&D to commercialization	- Maintain subsidies as needed to achieve significant cost and performance improvements of the most promising technologies	R&D delivers high performing materials and equipment that enable zero net energy buildings
			Tenant behavior	- Property tax reduction for energy efficient behavior compared to buildings' label expected performance - Launch extensive training programs for professionals	- Introduce energy awareness course in education programs	- Tenants are incentivized to become more energy aware and to reduce energy consumption
Education, training and communication		Education & training of professionals & the general public	- Communicate energy usage and performance information for all public buildings - Launch sustained information campaigns on energy use and savings in buildings	- Introduce energy awareness course in education programs	- A new energy aware culture exists amongst citizens	
		Education, training and communication	- Take part in the education & training effort needed to promote energy savings for owners, users & tenants - Launch sustained information campaigns on energy use and savings in buildings - Develop energy performance targets of new developments	- Demand preferred financial conditions from capital providers for near zero net energy new developments	- Developers understand and value energy efficiency and include it in projects as standard practice	
Investors		Finance	Finance	- Address split incentive problem by engaging with new tenants to share cost and benefits of energy savings investments - Adopt lifecycle cost approach when taking design decisions	- Demand preferred financial conditions from capital providers for near zero net energy refurbishments	- Developers have financial interest to develop energy efficient buildings
			Specifications	- Set ambitious energy performance target as primary design goal - Require the use of energy management systems and individual metering	- Tighten targets for building operations & performance - Use Integrated Design Contract (IDC) tender format with emphasis on energy performance requirements	- Developers include ambitious energy efficiency targets as primary design goals
		Procurement	Procurement	- Restructure contractual terms to incorporate early contractor involvement as part of the design team - Base design team fee structure and incentives on successful energy performance	- Introduce specific decision making process on all components that affect operational energy use	- Developers include ambitious energy efficiency targets in their procurement process
			Education, training and communication	- Take part in the education & training effort on voluntary behavior to a globally recognized principles or codes of conduct - i.e. Principles for Responsible Investment (UNEP/Global Compact) or The Equator Principles - Transparently report on energy efficiency practices across all energy efficiency and managers in dialogue with avoided energy efficiency	- Actively seek creation of securities (new constructions or energy efficient retrofits) backed by certified energy efficient buildings or cash flow from energy savings - Publicly share best practices	- Utilities promote a new energy aware culture amongst customers and other stakeholders
	Asset portfolio	Asset portfolio	- Evaluate risks using broader measures such as property portfolio, market change, regulation - Add efficiency metrics and goals to investment practices - Equally require disclosure of energy efficiency strategies - Rank portfolio investments based on expected performance - Target fixed income investments in securities that address energy efficiency	- Regularly survey customers and craftsmen to understand their knowledge and information needs with respect to energy efficiency - Reinforce current knowledge and deliver new information on a regular basis	- Utilities manage existing smart grids	
		Finance	- Deposit available cash in financial institutions who have lending programs targeted at energy efficiency retrofits - Use energy efficiency analysis to enhance traditional decision-making - Reprofit model risk reduction including first cost, operating costs, savings & sale value/rental, identity, brand	- Adopt lifecycle cost approach to investment decisions - Assign value to energy efficiency through financial mechanisms and funding sources	- Utilities manage existing smart grids	
	Utilities	Education, training and communication	Distribution network	- Develop smart meters for improving knowledge of final energy use - Transition to smart electricity grid using digital technology to save energy	- Provide customers with smart solutions to promote energy efficiency - Integrate more local renewable energy with centralized low carbon energy systems where possible	- Utilities manage existing smart grids
			Commercial offer	- Develop pricing schemes that incentivizes energy savings - Launch commercial offers to promote energy savings i.e. energy audits, consulting, technical support with energy efficient solutions, financial support - Develop energy performance contracting (EPC), ESCO or other players to offer innovative contracts guaranteeing the level of services and energy savings to the customer - Develop financing schemes on investments with return on energy savings	- Maintain successful commercial offers and adjust them to changing customer needs - Integrate technology to allow information transfer between equipment and systems - Allow metering and bi-directional utility power flow - Execute strategy for lowering carbon content of existing generation and bringing clean generation assets on line	- Commercial offer and pricing rewards energy savings
	Suppliers and manufacturers	Demand side management	Demand side management	- Incorporate tools to allow local feedback to end users on consumption and expenses - Make energy generation evolve towards lower carbon content	- Ensure all customers receive & understand information & training - Make it as easy as possible to lower the skill level necessary for use	- Suppliers understand the crucial role they play in developing an energy aware customer base
			Energy mix	- Invest in renewable energy solutions for buildings	- Adopt standards in all countries - Equip appliances with information sharing capability for utilities	- Compliance to highest appliance standard
Education, training and communication		Education, training and communication	- Provide contractors and end-user with training and operations - Cooperate with government authorities to create appliance standards and labels	- Sustain awareness throughout customer base	- Suppliers join forces with government authorities in favor of energy efficiency	
		Appliance standards	- Develop marketing campaigns to promote building's energy performance rather than single components - Re-set equipment pricing in line with energy efficiency	- Phase out low performing equipment - Incorporate new technologies into product lines for common use - Bring to market metering and controls to management energy efficiency	- Suppliers provide market with affordable next generation energy efficient solutions	
Research and Development		Research and Development	- Increase efficiency of current equipment - Applications to support smart net emission buildings between equipment and systems - Provide tools to allow local feedback to end users on consumption and cost	- Support continuing education on energy efficiency eventually making it an essential job requirement or performance criterion	- Designers and contractor implement energy efficiency as a standard practice	
		Design process	- Enroll in energy efficiency training program - Include energy efficiency in educational programs and training to owners and occupiers - Reward those who attain a high level of proficiency - Provide voluntary certifications for projects to promote energy efficient constructions and use	- Adopt IDC (Integrated Design Contract) format with emphasis on energy performance requirements	- Zero net energy designs are the norm	
Design		Design	- Apply common measurement system - Apply integrated design process (IDP) with design team - Promote use of energy efficient design technologies - Incorporate ICT into design & construction process - Consider energy performance-based fee structure	- Develop holistic approach of energy efficiency in design - Use passive design strategies as first step toward improving energy efficiency - Develop energy efficient design solutions for retrofits - Plan local energy production to minimize requirements for grid energy where efficient and environmentally responsible - Design new buildings for flexibility and ease of implementation in future retrofits and alternative uses	- Know how on zero net energy buildings is widely applied across the sector	
		Education, training and communication	- Require information on energy performance through voluntary certification systems and programs - Receive training in how to operate one's building(s)	- Acceptance of new energy efficiency features, including those that affect appearance	- Building occupants fully comprehend and value energy efficiency	
Occupiers		Behavior and mindset	Behavior and mindset	- Raise demand for high performing buildings - Develop energy aware culture and respond to information about personal behavior and effect on energy usage	- End-users recognise change in demand	- Occupiers are at the origin of a new energy aware culture