GBPN
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in partnership with

KPMG

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BUILDINGS FOR OUR FUTURE

The Deep Path for Closing the Emissions Gap in the Building Sector

ACKNOWLEDGEMENTS

This report is a synthesis work of two studies commissioned by the GBPN.

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ABOUT THIS REPORT

Buildings for Our Future is the culmination of two major studies commissioned by the GBPN. The GBPN commissioned the Lawrence Berkeley National Laboratory (LBNL), United States, to identify and analyse the best performing building energy policies implemented today and the Central European University (CEU) Center for Climate Change and Energy Policy (3CSEP), Hungary, to determine the best-possible CO_2 mitigation scenarios globally and in each of our target regions.

Buildings for Our Future first explores the mitigation potential from buildings in China, European Union (EU), India and the United States (US) and provides an overview of the analysis of the array of policy options used to improve the energy performance of buildings in these regions. The key issues that influence the way forward are then presented. Finally, the report provides instruction for drawing up roadmaps for the design and implementation of a Deep Path aiming to realise the building sector's significant mitigation potential.

THE DEEP PATH

CLOSING THE EMISSIONS GAP IN THE BUILDING SECTOR

Climate change has been a pressing and turbulent issue for the past twenty years, and likely represents the defining challenge of our time. If we are to avoid the most severe consequences of climate change, action is needed now to enable Deep savings in energy use across the global economy. With buildings accounting for around 30-40% of global energy-related CO_2 emissions and offering the most cost-effective mitigation potential, the sector has become a focus for climate change policy-makers. Yet as this report highlights, our current building energy policies are not on-track to deliver the sector's CO_2 mitigation or energy savings potential. Instead there is an increasing emissions gap between where we are headed and where we need to be in order to ensure the building sector plays its part in achieving less than 2°C global warming.

Buildings for Our Future provides a platform for policy makers and business leaders to work together to close this gap and move towards a Deep Path for energy related CO_2 emissions cuts in the buildings sector. It draws on two GBPN research efforts to reveal the Deep potential of the building sector to deliver significant CO_2 and energy savings and the opportunities and limitations of today's best policy practices. The report shows that by shifting from current trajectories to Deep Path polices, by 2050 we could inhabit a built environment that consumes 30% less energy for heating, cooling and hot water than we do today – despite having increased total built floor area by 130% over the same period.

Peter Graham
Executive Director
GBPN

The outcomes reinforce the findings of other international organisations that significant greenhouse gas emissions (GHG) savings are realisable with the application of existing technologies and knowledge, and that actions on emissions savings are consistent with social and economic goals. However, the outcomes also show that a significant increase in the level of ambition of supporting policy frameworks is needed quickly if we are to meet energy and climate objectives by 2050.

Moving toward the Deep Path is going to be challenging. To contribute to the 2°C goal, the building sector will need to limit its annual global CO_2 emissions to 25 % below business-as-usual projections in 2020 and 50% below projections by 2030. It will require widespread adoption of today's state of the art policies and technologies including net-zero or positive energy requirements for new buildings and more and deeper energy efficient retrofitting of the existing building stock. However, *Buildings for Our Future* outlines concrete steps for creating ambitious but realistic policy road-maps adaptable to individual regions and local contexts. It also provides a clear objective for more effective global collaboration, dialogue, and sharing of best practices . In commending this report, I invite you to join with the GBPN and its partners to move the buildings sector onto the necessary Deep Path to tackle climate change.

WHY BUILDINGS HOLD THE KEY

CATALYSING A SUSTAINABLE AND PROFITABLE FUTURE

Over the next twenty years businesses, governments and society will be exposed to a number of global megaforces such as population growth, energy insecurity, resource scarcity and climate change. Navigating these megaforces will be a complex and challenging task and business leaders across the world will face significant risks, as well as new opportunities, for their business models.

Yvo de Boer
Special Advisor
KPMG

Avoiding the worst effects of one of these megaforces – climate change – by stabilising temperature rises to 2°C by 2050, will require all energy-related sectors including agriculture, buildings, energy supply, forestry, industry, transport and waste to take action. Ambitious CO_2 emission reduction targets and strategies for unlocking these sectors' full mitigation potential are needed.

It is widely recognised that the building sector accounts for around 30-40% of global energy use and more than 30% of global CO_2 emissions. Research undertaken by the Intergovernmental Panel on Climate Change (IPCC) demonstrates that energy efficiency in buildings offers the greatest potential to cut CO_2 emissions - nearly one quarter of the total mitigation potential of the sector. Compared to other sectors such as transport and agriculture, buildings also offer the most cost effective potential to make these deep cuts.

In this report, the GBPN with support from KPMG, provide a comprehensive picture of the significant energy reduction and greenhouse gas mitigation potential from buildings and investigates the most effective policy instruments for now and for years to come. Through the GBPN and its regional hubs, policymakers around the world will be able to learn about the most advanced building technologies and policies that put us on the path towards deep energy reductions.

In times of economic and political austerity, the building sector is an important source of jobs and the application of new energy efficient technologies can grow this substantially. Globally, the building industry already supports more than 100 million jobs, and contributes US$ 7 trillion, representing nearly 12% of global GDP. Beyond its direct contribution to the economy and environment, promoting energy efficiency in the built environment is also deeply connected to social development, health and wellbeing.

Businesses can take the lead in this endeavour by developing and implementing energy efficient techniques, applying new skills and business models to improve the performance of our global building stock. But progress requires collaboration and policymakers have a critical role in creating a regulatory framework that catalyses a profitable and low carbon future for our built environment.

CHAPTER ONE

THE CHALLENGE

Buildings at the Crossroads

Buildings have a key role to play in energy and climate policies. Globally, they account for 30% to 40% of total final energy demand and over 30% of all energy-related CO_2 emissions. The four priority GBPN regions – China, Europe, India and the United States – together represented more than 60% of global final building energy use in 2005. China and India, in particular, are growing at a rapid pace.

Energy and climate policies are complex, offering many possible paths to achieve global and regional goals. Two main inter-playing factors feed into this complexity. First, long-term climate goals are still being developed and negotiated both regionally and globally and second, there is no common agreement on the best path to follow for effective CO_2 emissions mitigation. Some want to follow the path of increased renewable energy supply to meet the demand for energy services. Others believe it is important to first address energy efficiency and then look at the supply side. While many domestic and international factors will influence the direction taken, countries need support now to enable the rapid definition and implementation of an appropriate and optimal path for tackling climate change.

Buildings account for:

→ **30% to 40%** *of total world's final energy demand*

→ **more than 30%** *of all energy-related CO_2 emissions.*

More than 60% *of global final building energy use in 2005 come from the 4 priority GBPN regions (China, Europe, India and the United States).*

The GBPN enters this policy dialogue to document, inform, and clearly communicate the significant energy reduction and saving and CO_2 mitigation potential embodied in current and future building policies. To this end, the GBPN research compiles and shares best practices that help advance policies and tools for policy makers leading to very low energy consumption in both new buildings and through retrofits of existing buildings.

Buildings for Our Future provides evidence from a recently completed analysis commissioned by the GBPN that demonstrates the significant role that energy performance improvements in buildings in China, the EU, India and the US can play in reducing the building sector's impact on climate change. The analysis further shows that only a major and rapid shift in thinking and action to improve new and existing buildings' energy performance will lead to a Deep Path of reduced energy consumption and CO_2 emissions from buildings. This report provides key recommendations on how to move to this Deep Path based on up scaling best building performance practice policies globally.

The four priority GBPN regions demonstrate broad diversity in their history, their economic and demographic growth patterns and their policy approaches. However, the rest of the world looks to these regions for unified leadership, innovation and solutions to address climate change concerns. As they collectively represent around 65% of the energy savings potential of the building sector globally, they must show the path forward if we are to avoid the worst-case impacts of climate change.

The GBPN seeks to limit annual global CO_2 emissions to ***25 %*** *below business-as-usual projections in 2020 and* ***50%*** *below projections by 2030 compared to 2005 levels.*

Linking climate and energy goals

From a climate change policy perspective, GBPN supports a limitation of annual global CO_2 emissions to 25 % below business-as-usual projections in 2020 and 50% below projections by 2030. The 2009 Copenhagen Accord recognises "the scientific view that the increase in global temperature should be below 2°C, on the basis of equity and in the context of sustainable development, to combat climate change."[1] Governments of GBPN's priority regions support this ambitious target. *Buildings for Our Future* describes a path forward in which improving the energy performance of buildings can play a vital role.

From an energy policy perspective, limiting the global temperature increase to less than 2°C relies upon having a sustainable, low-carbon energy system in place by 2050. This implies a carbon emissions reduction of a factor of four by 2050 from 1990 levels in some regions.[2] Policies that support a sustainable energy future also support increased energy security, increased energy access, improvement of health, reduction of fuel poverty and stimulation of sustainable economic growth.

1 For more information see http://unfccc.int/meetings/copenhagen_dec_2009/items/5262.php

2 For example, the EU has committed to reducing GHG emissions in 2050 by 80-95% from 1990 levels. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0885:FIN:EN:HTML

But are we on the right path? The answer is ‘No’. Research commissioned by GBPN and others[3] show that we are not moving towards such a sustainable energy future. However, it is possible to get on to this path in all four GBPN regions by implementing state-of-the-art building energy performance policies and technologies. This is what the GBPN calls *Deep Path thinking*.

Transforming the Buildings Sector

Most improvements in building energy performance are modest – usually in the range of 10% to 20% for specific energy efficiency interventions. Until recently, those improvements have generally been considered as enough. However, if the energy and climate goals described above are to be achieved, we have no choice but to dramatically upscale our performance target.

> *“… we have **no choice** but to think Deep.”*
>
> *– Diana Ürge-Vorsatz*
> *Director of the Center for Climate Change and Sustainable Energy Policy [3CSEP], Central European University*

> *“Acting Deep means dramatically upscaling the development of **state-of-the-art buildings** that can follow the Deep Path towards energy and related CO_2 reductions from buildings in each region.”*
>
> *– Jens Laustsen*
> *Technical Director*
> *GBPN*

This means that transformational policies for both new and existing buildings need to be implemented at a scale that none of the priority GBPN regions has experienced before. A long-term policy framework built upon consensus between governments and key stakeholders comprising ambitious policy measures to upscale energy efficient buildings must be developed and implemented.

The appropriate level of ambition for a given country depends on many international and domestic factors, including the priority given to buildings in relation to other policy options. *Buildings for Our Future* reveals that each priority GBPN region has a broad set of effective policies that can be implemented in the short term, and initiate the transformation of the buildings sector.

3 In particular, the Emissions Gap Report 2012 by the United Nations Environment Programme [http://www.unep.org/publications/ebooks/emissionsgap2012/] and the World Energy Outlook 2012 by the International Energy Agency [http://www.worldenergyoutlook.org/]

THE MITIGATION POTENTIAL

Opportunities for Global Energy and CO_2 Emission Reductions from Buildings

The current trends and dynamics in the buildings sector – population growth, increasing floor area, massive increases in new construction and a large inefficient existing building stock to name but a few – make assessments of the energy-related CO_2 mitigation potential of the buildings sector a very complex task. When one adds the issues of the availability and quality of data as well as the need for new analytical methodologies, the challenge increases again.

In this context, the GBPN commissioned two global studies to enable a better understanding of the global potential for CO_2 emission mitigation from buildings that best-practice policies could deliver by 2020, 2030 and 2050 and to provide a definition of the concept of best practice.

First, the Center for Climate Change and Sustainable Energy Policy at Hungary's Central European University (CEU) assessed the global potential for GHG emissions mitigation from buildings. The work required an intensive assessment of best practice energy policies and building technologies as well as the development of a detailed global database of thermal energy use in the building sector for 14 regions.

To complete their analysis, the CEU used a model based on a novel performance-based approach to analysing how buildings use energy to provide thermal comfort and hot water (thermal energy). This approach considers a building as an entire complex system and not as a sum of individual components. Therefore, national and regional building energy consumption dynamics were not modelled based on individual energy-efficiency measures, but based on exemplary buildings with measured and documented energy performance.

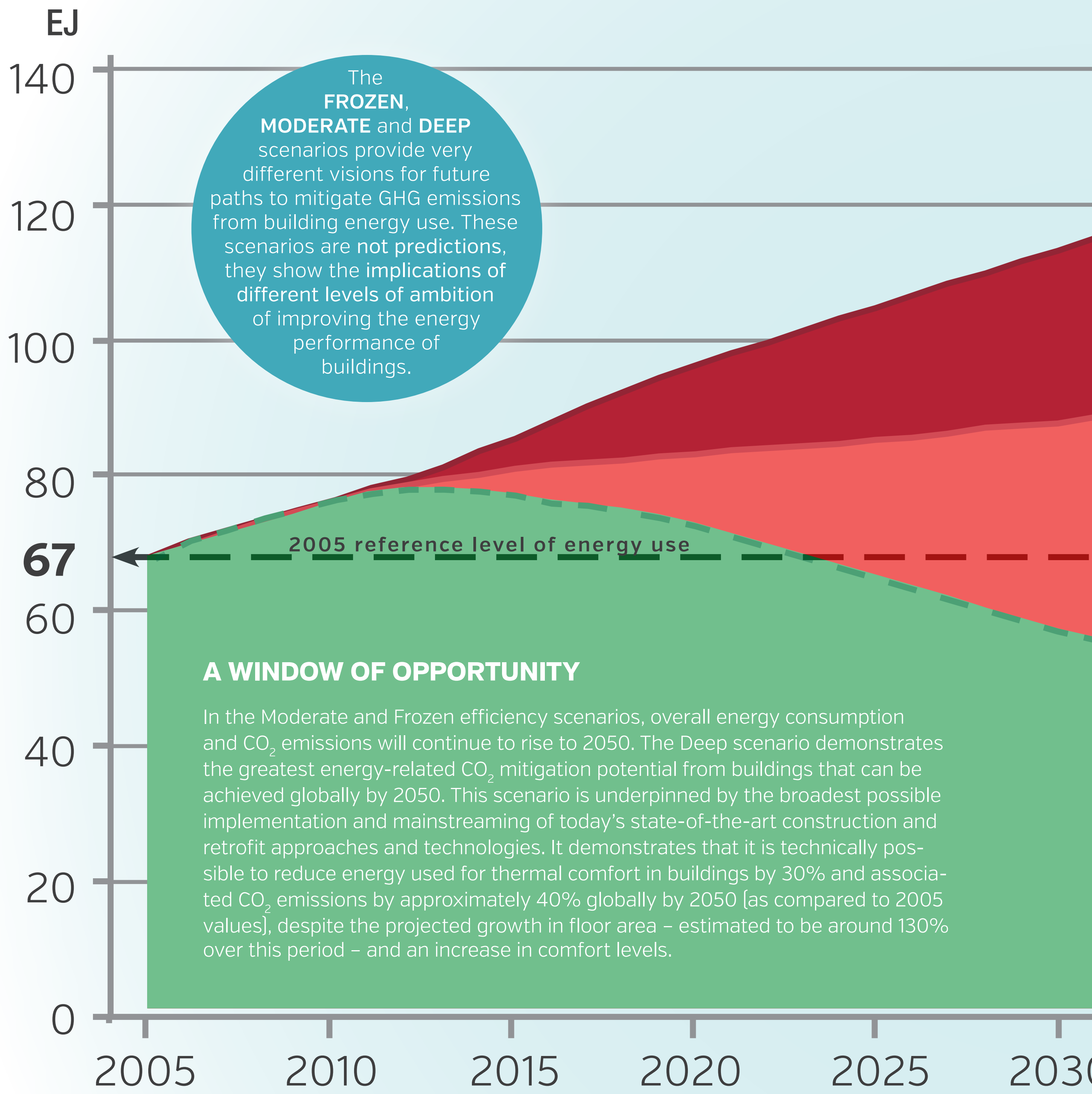
Three policy scenarios were developed to assess and compare the mitigation potential, taking 2005 as a base year:

- The Deep efficiency scenario incorporating today's state-of-the-art know-how and technologies (i.e. best practice);
- The Moderate efficiency scenario that illustrates the development of energy use under recent (i.e. business-as-usual) policy trends; and
- The Frozen efficiency scenario, which is the reference scenario based on no new policy or market developments since 2005.

These scenarios represent three broad options facing policymakers. Rather than a forecast, they provide insights on how savings potential can be best captured. The Deep and the Moderate efficiency scenarios both require changes to today's policy strategies, with the Deep efficiency scenario requiring a much more ambitious approach than is currently the norm. The three scenarios are described in more detail in the following two figures.

FIGURE 1

THE MITIGATION POTENTIAL



A WINDOW OF OPPORTUNITY

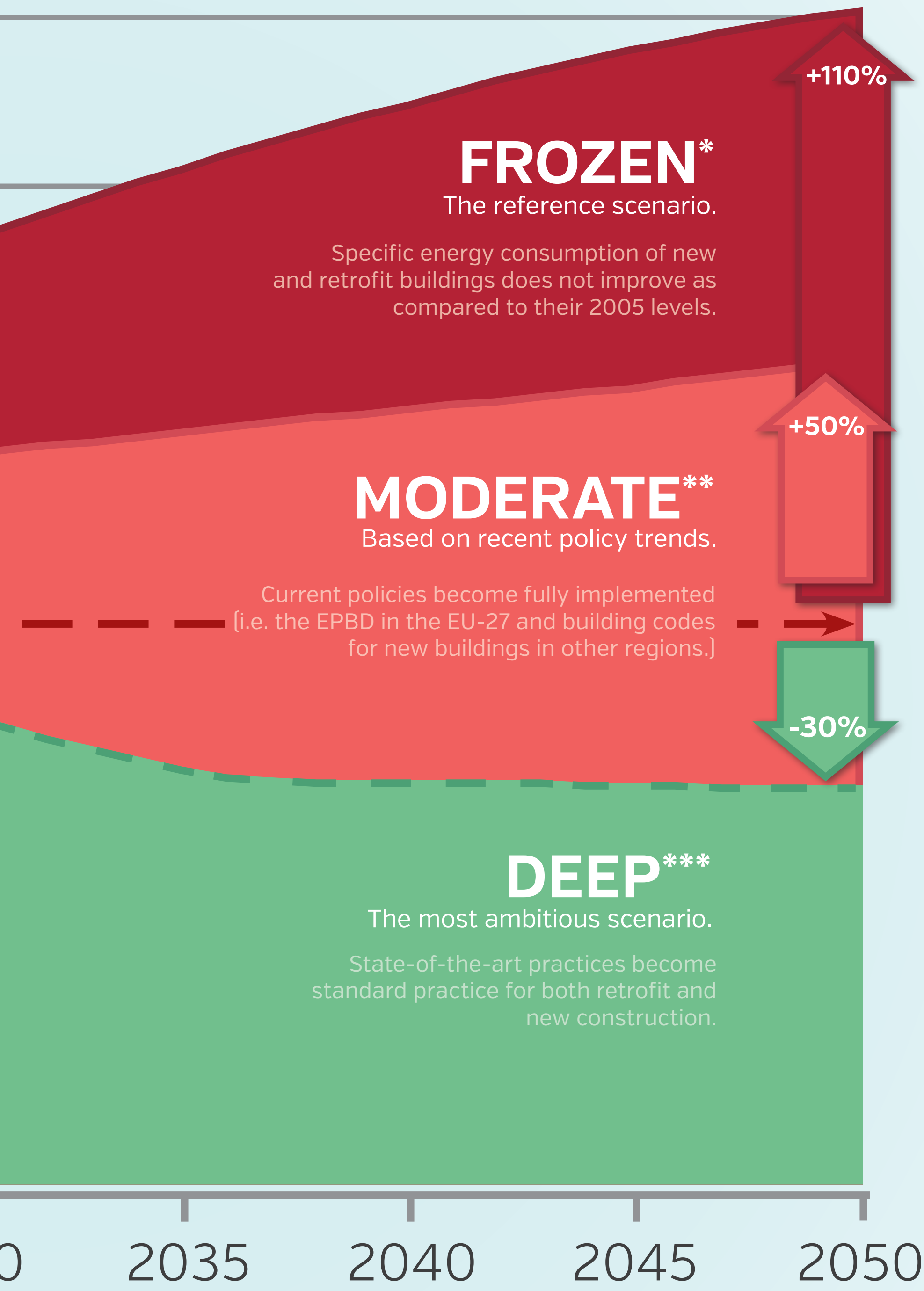
In the Moderate and Frozen efficiency scenarios, overall energy consumption and CO_2 emissions will continue to rise to 2050. The Deep scenario demonstrates the greatest energy-related CO_2 mitigation potential from buildings that can be achieved globally by 2050. This scenario is underpinned by the broadest possible implementation and mainstreaming of today's state-of-the-art construction and retrofit approaches and technologies. It demonstrates that it is technically possible to reduce energy used for thermal comfort in buildings by 30% and associated CO_2 emissions by approximately 40% globally by 2050 (as compared to 2005 values), despite the projected growth in floor area – estimated to be around 130% over this period – and an increase in comfort levels.

****Deep Scenario Assumptions*

- After 2022, most renovations and newly built structures will be of a very high-energy efficient design as today's exemplary buildings in the same (or a similar) climate zone.
- Energy efficiency retrofit rate: By 2020 increases from 1.4% p.a. to 3% p.a., then constant

***Moderate Scenario Assumptions*

- New buildings are built to the level of currently valid regional building codes.
- On average, retrofitted buildings achieve energy savings of 30% as compared to the existing buildings built before 2005.
- Energy efficiency retrofit rate: By 2020 this increases from 1.4% p.a. to 2.1% p.a. (EU, US), 1.6% p.a. (China) and 1.5% p.a. (India)



THREE SCENARIOS

FROZEN

By 2050, energy use in buildings could more than double and CO_2 emissions could increase by 68%.

MODERATE

By 2050, energy use in buildings could increase by almost half of what it is today and CO_2 emissions could increase by 20%.

DEEP

By 2050, energy use in buildings could be reduced by nearly a quarter of that of today and CO_2 emissions could be reduced by around 30%.

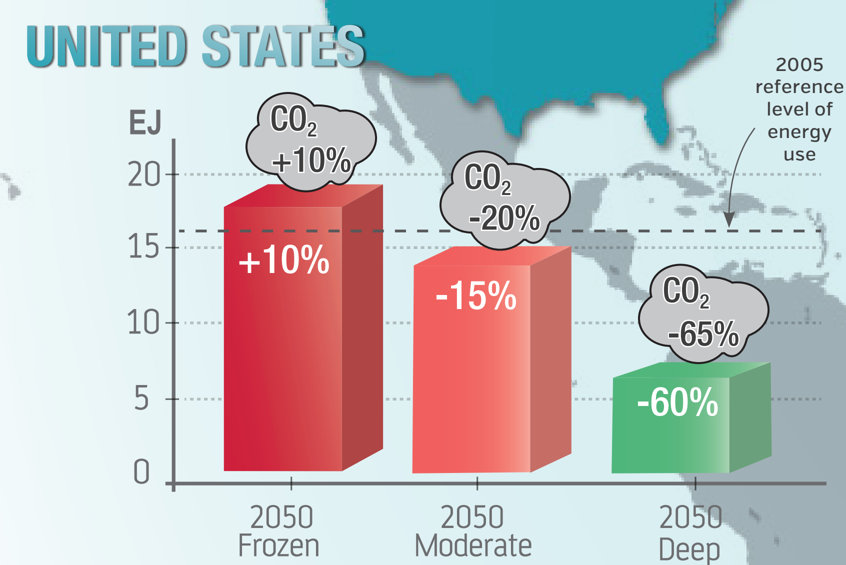
**Frozen Scenario Assumptions*

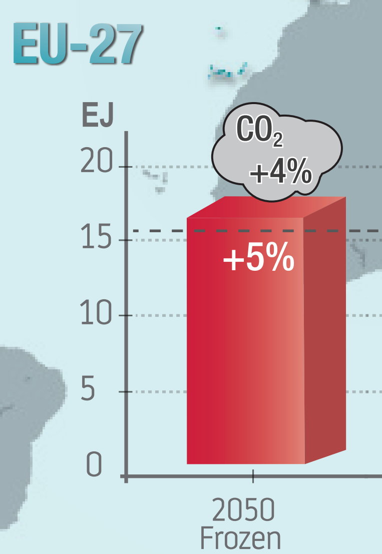
- New buildings' specific energy consumption is higher than that in Moderate scenario due to a lower level of compliance with building codes.
- Existing buildings undergoing renovation consume around 10% less than standard existing buildings for SH/C.
- Advanced retrofit is not considered in any region.
- Energy efficiency retrofit rate: 1.4% p.a.

FIGURE 2

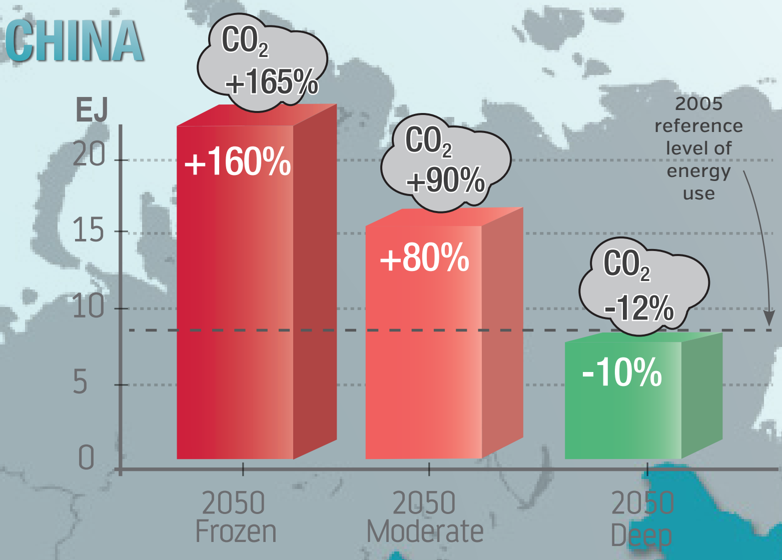
THE MITIGATION POTENTIAL

The graphs show the thermal energy use profiles for the base year (2005) and the three scenarios for the target year 2050. The percentage changes for thermal energy use and CO_2 emissions are also indicated. While there are stark differences between regional projections, all four regions should work together to exchange best-practice policy frameworks and know-how if they hope to deliver the maximum possible global CO_2 mitigation of buildings.

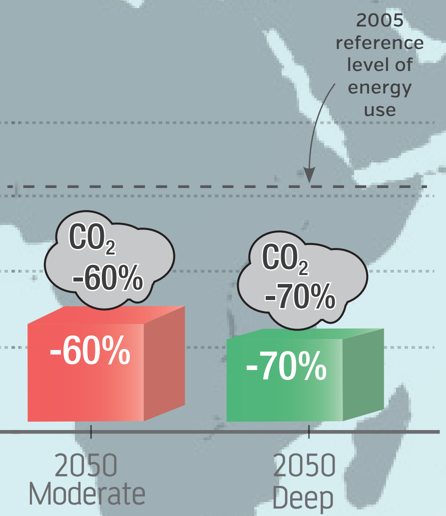




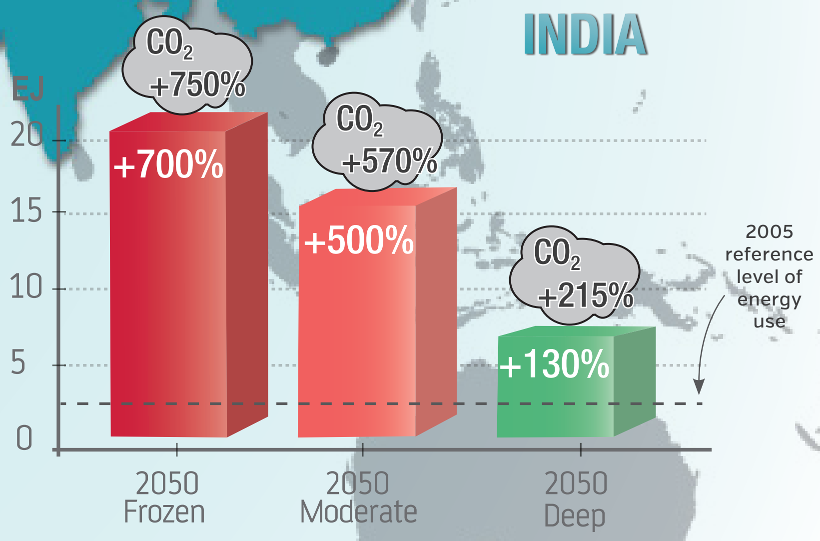
The difference in 2050 between the Frozen and Deep scenarios is more than 70% of the US building consumption; this accounts for **more than the total residential energy consumption in the US today**. The difference between the Moderate and Deep scenario is more than 50%.



The difference between Frozen and Deep is around 150 % or **almost 1.5 times the consumption of today's Chinese buildings**. The difference between the Moderate and Deep scenarios in 2050 is around 80%.



The difference between the Frozen and Deep scenarios in 2050 is more than 70% of Europe's building consumption today; **this is greater than the total consumption in all of Europe's residential building stock today**. The difference between the Moderate and Deep scenarios in 2050 is around 10%.



In 2050 the difference between the consumption of the Frozen and Deep scenarios is similar to almost 6 times the consumption of all of India's building consumption today. The difference between the Moderate and Deep scenarios in 2050 is **around 4 times the consumption today**. Most of the growth in India comes from new residential buildings. The short-term focus should then be on achieving the energy savings potential of new construction.

THE CURRENT POLICY FRAMEWORKS

Achieving the energy savings described in the Deep scenario requires governments to aspire to a greater level of ambition within building energy policy frameworks. This includes the design, implementation and enforcement of increasingly forward-thinking building energy performance policies and programmes. But what are the state-of-the-art examples to follow? Given the urgent need to improve building energy performance globally, it is necessary to assess which existing policies in the world today have the largest impact and represent new best practice policies.

To this end, the GBPN commissioned Lawrence Berkeley National Laboratory (LBNL) to undertake a comprehensive review of existing policies in the four GBPN priority regions to gain a better understanding of their use and effectiveness. LBNL's analysis provides a detailed survey of the use of building energy codes, energy labels and financial instruments, and compares their design, implementation and enforcement.

LBNL Study Key Conclusions

The report reveals that there is a wealth of experience with building energy-related policies and programmes within China, India, the EU and the US. Nearly forty years have passed since the oil crises of the 1970s catalysed the first popular push for energy efficient buildings. The events of that period led to the dramatic change in the consciousness of energy use and the development of energy saving innovations in building policy, technique and technology domains. This same underlying spirit of change is needed today. The existing knowledge and experience documented in these regions provides a strong foundation for the future, and can be drawn upon to shape new best-practice policies and shift the building sector to the Deep Path.

The LBNL report also highlights that there is a need for a regular review and sharing of best practice policies and programmes. Regions can learn from their peers by networking and sharing successes and lessons learned. This can enable them to implement existing policy measures more effectively, and stay on the leading edge of new innovations.

The conclusion of the study is straightforward: no region is on the Deep Path. However, there are some innovative programmes in all four regions and good indications mainstreaming could happen relatively quickly with strong, supportive policy commitment.

There is also much more to be done in the area of research and analysis. The LBNL study is but the most recent of a growing body of literature on best practices. There is a need for more policy evaluation, more monitoring, better data collection and better sharing on key issues, such as compliance.

Regional Factsheets

The following regional factsheets provide the key findings from research on the four priority GBPN regions. They constitute a short summary of national or regional initiatives and give a good indication of the level of ambition of the most widely implemented policy instruments in each region.

CHINA

China has been steadily improving its buildings' energy efficiency policies since the 1980s. As a general approach, China's central and local governments have recognised the need to adopt both regulatory policies (e.g., building codes) and market-based and financial policies (e.g., building energy labels and incentives) to improve building energy efficiency.

China's building codes have evolved significantly during the past decade, having set out mandatory and voluntary energy efficiency measures for both commercial and residential buildings. These codes are tailored to specific climate zones. The Chinese central government's growing emphasis on code enforcement and compliance has driven energy-efficiency improvements. China's Ministry of Housing and Urban-Rural Development (MOHURD) reported a significantly improved compliance rate since 2001.

If building codes would be combined with more holistic energy efficient building design strategies, it is estimated that the building sector's total energy consumption could level off around 2020 and about 44% of projected emissions could be avoided.

Although energy labelling (e.g. appliance energy information labels) has been an important policy tool in China's energy-efficiency efforts, whole-building energy labelling is relatively new and still voluntary. There are two domestic building energy-labelling programmes under development by MOHURD: the Green Building Evaluation and Labelling (GBEL) Programme and the Building Energy Efficiency Evaluation and Labelling (BEEL) Programme.

China's major building energy-efficiency incentive programmes have all been created to support and meet specific targets. China's building efficiency incentives subsidise some of the up-front costs of efficiency measures. These incentive amounts are made possible by large investments from the central government as well as some innovative local cost-sharing mechanisms.

Given the unprecedented rate of growth in new construction, China's energy-efficiency codes and labelling and incentive systems face major challenges. There is room to develop technical expertise to implement and enforce more stringent codes. The building codes strategy alone, however, would only slow down the growth rate of building sector's energy use through 2030 while avoiding as little as 25% of projected GHG emissions. If combined with more holistic energy efficient building design strategies, it is estimated that the building sector's total energy consumption could level off around 2020 and about 44% of projected emissions could be avoided.

EU 27

EUROPEAN UNION

The EU is actively engaged in realising the energy saving potential of energy efficiency in buildings. The EU's 2002 Energy Performance of Buildings Directive [EPBD] [Directive 2002/91/EC, 2002] is a framework directive transposed into national legislation and implemented by all 27 member countries. The EPBD was revised in 2010 to significantly strengthen the energy performance levels of both new and existing buildings.

A key provision of the revised directive is that all new buildings after 2020 (or after 2018 for public authorities) must be nearly-zero-energy buildings (nZEBs). The EPBD mandates that minimum energy performance requirements must be set not only for new construction but also for existing buildings undergoing major renovation, the level of the performance standards are left to the individual member country. There is also a cost-optimality calculation methodology that all member states are to use in revising their building codes.

The GBPN European Hub – the Buildings Performance Institute Europe (BPIE) - estimates that by making significant progress towards full implementation of the EU requirements, CO_2 emissions from EU buildings can be reduced by 16% by 2020, compared to base year 2010.

Energy Performance Certificates are strengthened in the 2010 revision. They are mandatory on construction, sale or rental of all residential and commercial buildings and indicate a building's energy performance by ranking the building in comparison with peer buildings as well as reference values, such as minimum energy performance requirements. Large public buildings need special regular display labelling. Subject to criteria that were established, each country could design the certificates and labels for their own circumstances. The goal of comparative labels is to raise owner, purchaser and/or renter awareness.

A number of incentive schemes have been developed by member countries in Europe. The BPIE screened 333 different financial schemes being implemented. While there are many innovative schemes, one of the concerns is that there are few financial instruments targeting Deep renovation or zero energy buildings.

The EU adopted an Energy Efficiency Directive (EED) in October 2012 that requires, inter alia, the establishment of "long-term" strategies "for mobilising investment in the renovation of the national building stocks both for public and private sectors" prepared by member countries. The Commission will review the national strategies. The EED also requires that 3% of central government buildings must be retrofit annually at a high performance level. All measures in the EED are to contribute to the EU's 20% energy savings target by 2020 from 2007 levels.

The overall policy framework of the EU has been rapidly evolving over the last decade with an increasing level of ambition. Implementation and ambition levels are left to national governments. The Commission is working with member countries to help develop more support measures such as financing, awareness creation and training.'

INDIA

India is in the process of implementing its first energy code. In 2007, the Bureau of Energy Efficiency (BEE) launched a nationwide commercial building energy-efficiency code, the Energy Conservation Building Code (ECBC) and revised it in 2010. The Code sets minimum energy performance standards for the design and construction of new commercial buildings and is applicable to buildings with a demand of at least 100KW or 120KVA. The implementation of the code remains largely voluntary throughout India while local agencies work to develop the capacity amongst stakeholders in the buildings industry.

The Energy Conservation Building Code (ECBC) sets minimum energy performance standards for the design and construction of new commercial buildings – implementation of the code remains largely voluntary throughout India while local agencies work to develop the capacity amongst stakeholders in the buildings industry.

The ECBC has yet to be adopted by most of India's states and therefore the majority of India's new commercial buildings are not built under the requirements of the ECBC. However, the BEE has outlined particular areas where the code could become mandatory. To date, two states (Rajasthan and Odisha) have mandated the ECBC, six others (Gujarat, Karnataka, Punjab, Kerala, Uttar Pradesh and Uttarakhand) have initiated the process and seven additional states (Madhya Pradesh, Haryana, Chhattisgarh, Andhra Pradesh, Tamil Nadu, West Bengal and Maharashtra) have been identified as focus states by the BEE for the year 2012-13.

Although the ECBC covers large residential buildings, there are no specific building energy codes for the majority of the residential sector.

At present, India has a number of different building rating schemes available. LEED-India and Green Rating for Integrated Habitat Assessment, GRIHA, are the most popular in the marketplace and address many issues aside from building energy use. The BEE's Energy Star Rating System evaluates existing buildings based on their operational energy use. All rating and labelling systems in India are currently voluntary and are used in a relatively small part of new construction.

The majority of governmental and public financing incentives are for appliances, renewable energy, and efficient light bulbs. There are no incentives for saving on space heating and cooling.

A lack of minimum requirements for energy efficient buildings makes it more challenging for other states to follow suit and the relatively complicated system makes enforcement difficult.

The presence of multiple labelling systems can cause confusion, especially during these initial stages of energy-efficiency adaptation in India since most consumers are unaware of building energy use issues and there is no minimum baseline.

UNITED STATES

The US has established an infrastructure of energy efficiency policies, programs and tools. States in the US have the autonomy to develop, adopt, and implement building codes for new buildings. A few states have no statewide codes although some cities within these states have adopted standards at the local level. The federal Department of Energy (DOE) provides resources for the development of codes and incentives to states to encourage them to adopt the national energy codes. Local jurisdictions can decide to adopt either of the following model codes, American Society of Heating and Air Conditioning Engineers (ASHRAE) or the International Conservation Council (ICC). It is common for the commercial buildings sector to follow the ASHRAE code and for low rise residential buildings to follow the ICC code.

States can adopt the national code, with or without amendments. In progressive states, advocates push for codes that go beyond the baseline set by the International Energy Conservation Code (IECC). For example, California recently adopted a mandatory energy code that is 12% more stringent than the 2012 IECC. If all states adopted the 2012 IECC, 200 million metric tonnes of carbon dioxide emissions would be avoided every year, according to an analysis by the Alliance to Save Energy.

Current assessments of building energy codes by the Pacific Northwest National Laboratory (PNNL) predict annual energy savings of 1.8 EJ annual savings in 2030, which is lower than what the CEU's 'Moderate' scenario suggests.

In February 2009, the American Recovery and Reinvestment Act (ARRA) stipulated that any state receiving funds under this act must pledge to adopt the 2009 IECC, to create plans to achieve 90% compliance with the code by 2017.[4] Currently 74% of states have adopted a qualifying commercial code, and 66% have adopted a qualifying residential code.

4 US Department of Energy - American Recovery and Reinvestment Act (ARRA) (HR1) - Section 410, Feb 2009

Enforcing building codes is a major challenge because overall, enforcement is generally weak. Increasing enforcement requires more code officials and better training. An analysis by GBPN's US Hub, the Institute for Market Transformation (IMT), reveals an annual spending need of $810 million for compliance initiatives at all levels of government, including training, outreach, implementation, and enforcement.

In New York City, if the least efficient buildings could be brought up to the average, building energy use could be reduced 18% and GHG emissions by 20%.[7]

For existing buildings, the top priority is to have owners understand relative building energy consumption and easily recognise high performance buildings. To implement this, there is growing interest in benchmarking and disclosure of building energy performance at the state and local levels. New York City's Greener, Greater Buildings Plan includes the benchmarking and disclosure of energy use for all large buildings.[5] In 2012 New York City's report on the results of the first year of its ordinance found that there was a three to five times difference in the energy use per square foot in buildings.[6]

The US has many incentive programmes and financing mechanisms to encourage energy retrofits. Recent initiatives involve on-bill repayments and loans linked to property tax bills, both of which make the loan repayment more secure and attractive to lenders. Energy utilities have played a key role in incentives programmes in the US.

New initiatives include federally mandated mortgage practices to incorporate the energy performance of buildings to increase the borrower's ability to get a loan, allowing borrowers with high performance properties to receive larger loans or better terms. A proposed congressional bill is under consideration.

5 See http://www.nyc.gov/html/gbee/html/plan/plan.shtml

6 See: http://www.nyc.gov/html/gbee/html/plan/ll84_scores.shtml

7 Ibid.

CHAPTER FOUR

ACTING DEEP

Alarming *lock-in* risk

If building energy performance is not mainstreamed, there is a risk to ‘lock in’ lost benefits in terms of building energy performance and GHG emission reductions for the duration of a building’s life span. Therefore, it is crucial to act quickly to capture the maximum possible amount of building energy performance and savings.

The energy performance gap between the ´Moderate´ and ´Deep´ scenarios is significant. As shown in Figure 3, implementing today’s policy directions (i.e. the moderate scenario) in the GBPN regions will lead to a loss of energy saving potential equivalent to between 10% and 414% of building energy use (as compared to the Deep scenario), and inefficiency ‘locked-in’ by 2050 due to the long life span of buildings.

Unless an investment in significantly improving the energy performance is undertaken at the outset, the opportunity may be lost until the building is renovated. Renovation of existing buildings offer compelling opportunities for improvements but given the infrequency of retrofit opportunities, deeper savings can be lost for decades. This is called the “lock-in” effect.

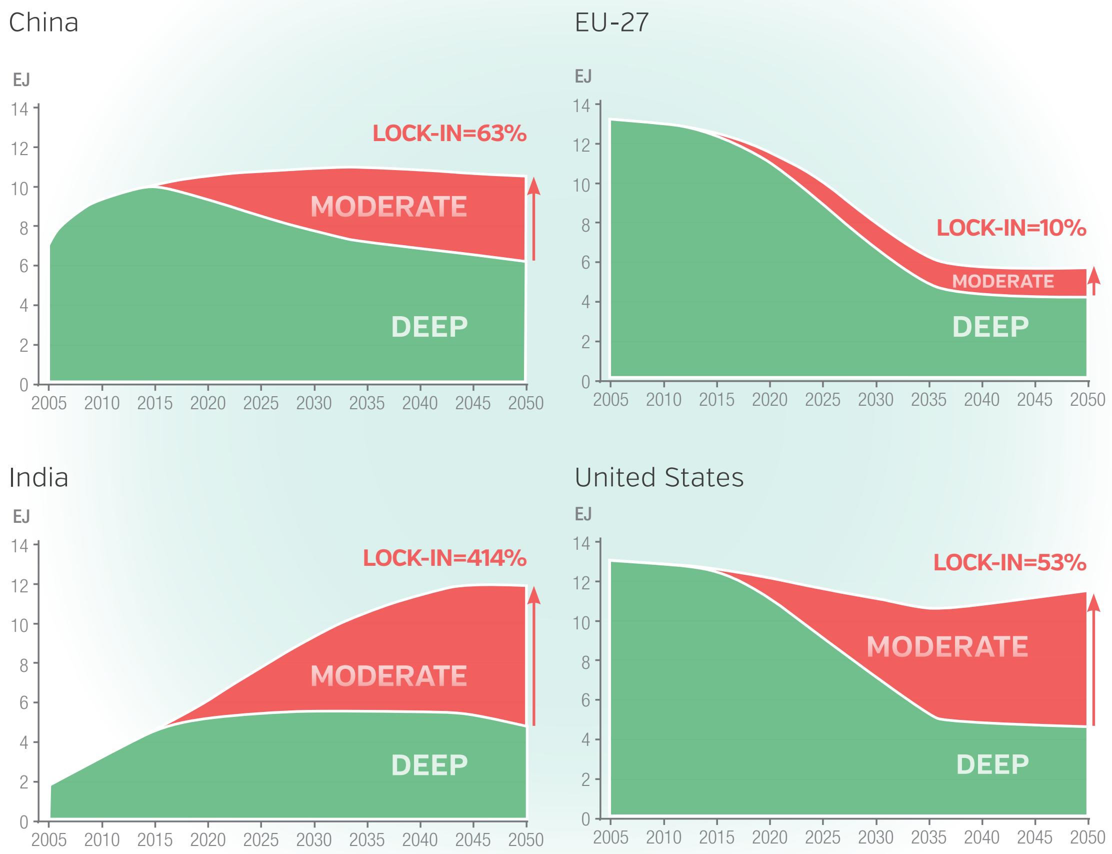
The “lock-in” effect originates from the fact that if moderate performance levels become the standard in new and/or retrofit buildings, it will become economically or often technically unfeasible to further reduce energy consumption in these buildings for many decades to come. Therefore, the building will be unnecessarily emitting much larger amounts GHG emissions than a building at a high energy performance level.

Buildings generally have a need for significant upgrades every 30 to 40 years, although it can be more frequent for commercial buildings. The lock-in effect could thus last for more than 30 years. For new buildings the lock-in can be even longer as some structures or parameters cannot later be changed. Therefore, decisions in the coming decade will also likely to have a major impact on building energy consumption beyond 2050.

The high lock-in risk highlights the crucial importance of early action, strategic policy planning, and ambitious energy performance levels in building codes for new construction and Deep major renovation.

FIGURE 3

Demonstrating the lock-in effect of the Moderate and Frozen scenarios in the GBPN regions



What will it take for buildings to go Deep?

The argument for the Deep Path so far has been based on energy and climate considerations. But is it technically feasible?

Achieving the Deep mitigation potential in buildings requires today's best practice energy efficiency techniques to be optimised, aiming towards positive energy for new buildings and deep energy renovation for existing buildings. This requires a transformative change of the building sector for both for new construction and existing buildings.

The GBPN review of best practice policies and programmes is intended to help countries assess their own approaches by determining the gaps, showing how to make improvements, and giving confidence for the way forward.

New Buildings

Few of today's building energy codes are designed to achieve the Deep Path, although many are being planned to incorporate ambitious objectives.

In all regions, state-of-the-art new buildings are being built mainly for "niche" markets. For example, "passive houses" are up to 5 – 10 times more efficient compared to a minimum performance requirement in most building codes in Europe and the US. Similar examples, although on a smaller scale, can be found in India and China. But those niche markets are slowly turning into the standard market model in several countries (see Figure 4).[8]

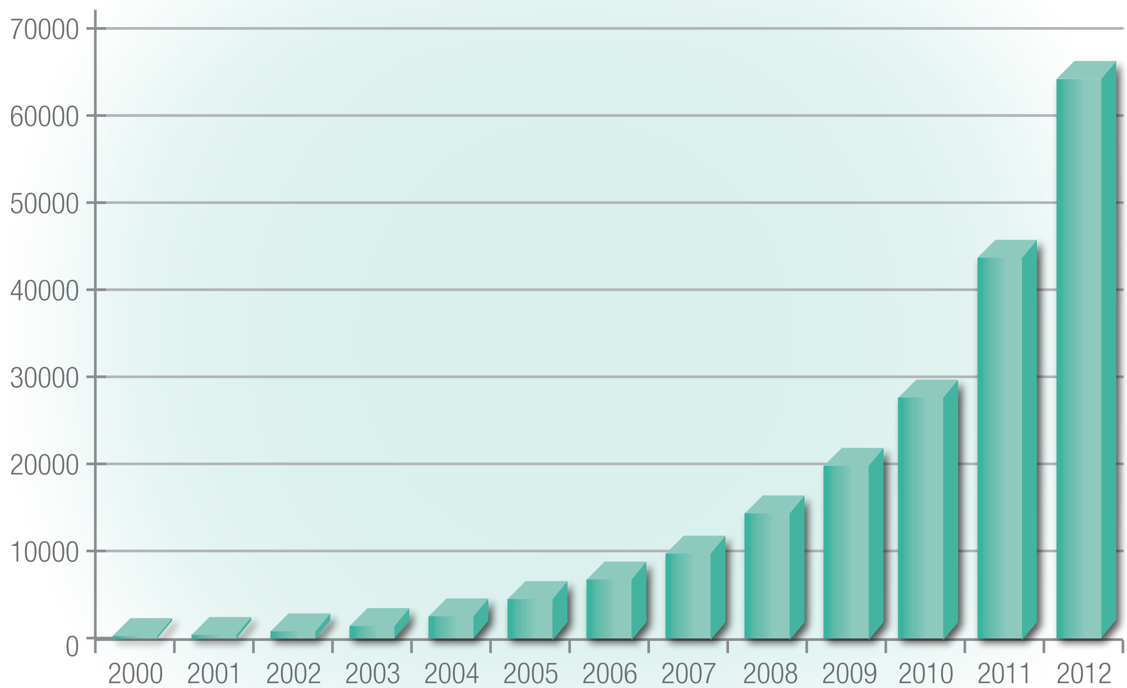
Going further, best-practice examples of buildings (both residential and commercial) that are zero energy or that have a positive net energy balance with integrated renewable energy technologies are starting to move beyond simple demonstration. The CEU study

8 In Austria almost 20 % of all new buildings are built as passive houses.

FIGURE 4

Passive House Trends in the 10 PASS-NET Countries

(Austria, Belgium, Croatia, Czech Republic, Hungary, Germany, Romania, Slovak Republic, Slovenia, Sweden, United Kingdom)



Source: International Passive Net Database, PASS-Net Project referenced in Chapter 2 shows that total costs over the lifecycle of these efficient buildings are similar or lower than those built using current standard construction techniques.[9]

Existing buildings

Taken as a whole, the existing building stock in all GBPN priority regions offers significant opportunities for improving energy performance that can be tapped into through renovations.

> *In recent years, China has been adding* ***more than 2 billion m²*** *of new floor space on an annual basis.*[10]
>
> *In India, the existing floor area of buildings will* ***increase by 4 times*** *before 2050.*
>
> *In Europe and the US the construction rates are much smaller and account for* ***only 1-2 per cent of the existing building stock*** *every year.*

Renovations are undertaken when a building needs to be maintained, improved or when a heating or ventilation system needs replacement. When this occurs an enhanced energy saving opportunity arises. Deep savings potential can be realised by improving the building envelope and the systems that supply the building with heating, cooling, ventilation, hot water, lighting or other services.

A standard renovation or refurbishment will often achieve savings of between 20% and 30%, sometimes even less. Much more is possible. State-of-the-art energy renovations that target the building in a holistic manner can often reduce energy consumption by 75% or even as much as 90%. Such projects save 3-5 times as much energy than that of a standard renovation project.[11] These savings can bring additional benefits to the user including higher occupant comfort levels and better health. Furthermore, they can have societal and economic benefits.

The CEU study referenced in Chapter 2 reveals that the current rate of renovation in developed countries is, in fact, too low for the 'Deep' scenario to be realised. A more aggressive energy-efficient renovation rate of 2.5% to 3% per year is needed.

State-of-the-art buildings – a holistic approach

Going 'Deep' is both possible and feasible, but we need a radical shift in the

9 CEU – A first assessment of major costs and benefits of low energy building pathways, 2013.

10 ACEEE – Buildings Energy Efficiency Policies in China, Status Report, 2012.

11 This is the classic principal agent/tenant barrier. The initial costs of these projects may be higher for the owner, but will yield savings over the building's life cycle, which can pay for the additional costs. Policy measures need to be developed to overcome such barriers. There is considerable literature on this topic.

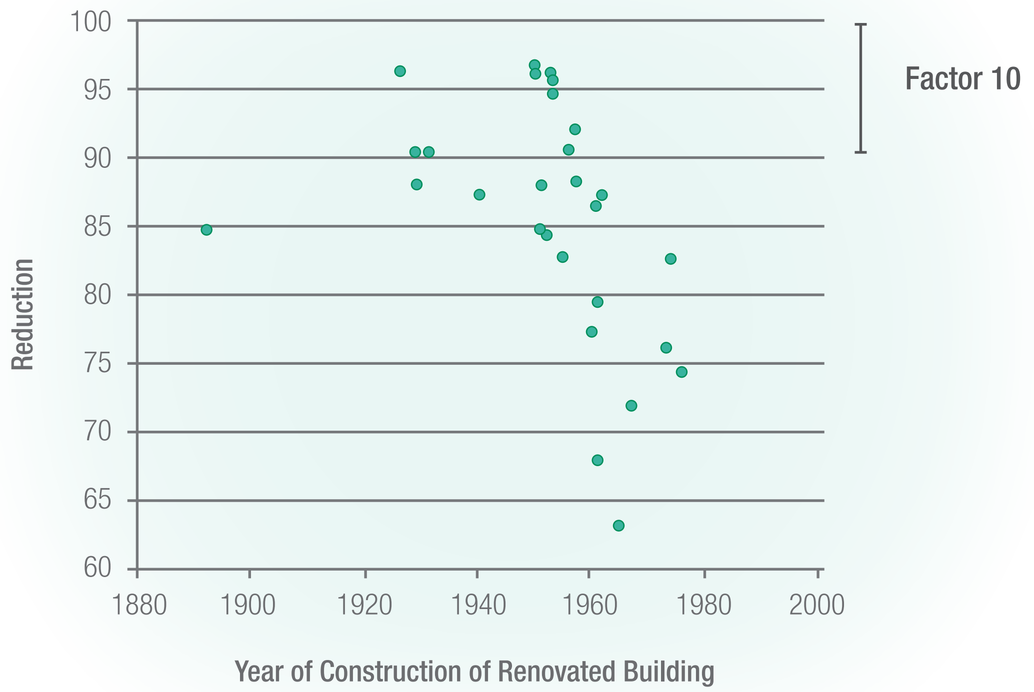
way we think about buildings. Today's best practices need to be rapidly scaled up in all climates and regions.

The large energy saving potential in buildings is already possible with the technology and techniques available today. Figure 5 below shows the findings of a study on a group of German buildings built 1880 and 2000 and renovated between 2004 to 2006. It shows that Deep renovation can often achieve a factor 10 energy reduction, depending on the age profile of the building under renovation. Recent buildings are more difficult to renovate to a factor 10 than buildings built in 1950s and 60s because they have a better standard. Similarly, it can be difficult to renovate old and heritage buildings to such levels.

Most of the existing building stock in Europe and the US was built when energy was cheap and abundant. Little or no attention was paid to energy efficiency or overall building energy performance. Even today, most buildings are designed and built based on principles where individual elements are assessed and optimised separately, without an integrated perspective on the overall performance. National or local requirements for buil-

FIGURE 5

Deep Renovation: Energy Consumption Reduction in relation to the Year of Construction of the Renovated Building



Source: DENA, German Energy Agency

dings are often based on prescriptive codes where minimum performance standards are set for the individual components such as windows, walls, roof, floors or technical systems. This leads to sub optimisation of the building and lost performance enhancement potential.

New buildings

State-of-the-art buildings that go beyond minimun standards are usually based on a "systems" approach that focuses on a building's overall performance – where each part of the building works together optimised as a whole. The systems approach is also called integrated design, bioclimatic design or passive design, and in such buildings it is possible to achieve energy savings consistent with the Deep scenario, without additional costs over the life cycle of the building. With a systems approach, the building shell and passive (free) energy are optimised to reduce energy demand. Additional costs for design and passive measures are balanced out by a reduction of investment costs on other parts of the building and the supply system.

There are many integrated bio-climatic design examples and concepts that have been proven to work. In all cases, energy use needs to be taken into account during the early stages of the design process and remain in focus throughout the construction and commissioning process. This requires considerable collaboration between the design and construction activities. The know-how and technologies are readily available, yet the use of such concepts has not achieved mainstream market penetration.

Reducing energy consumption and offsetting investments by renewing technical systems can become a driver for more and better improvements of the building itself.

Existing buildings

A systems approach can also be applied to improvements or renovation of existing buildings. Such an approach can be called holistic, integrated or Deep renovation.

Reducing energy consumption and offsetting investments by renewing technical systems can become a driver for more and better improvements of the building itself. They yield savings in technical systems and over the lifetime of the building and this can be used to pay for additional investment costs in improving the building itself.

Applying integrated design principles to the renovation of existing buildings can be more challenging due to the fixed nature of some building characteristics (e.g., orientation) and make it more difficult to increase the use of passive energy or other techniques. As with new building construction, Deep renovation requires more comprehensive planning and closer collaboration among all actors involved.

Regardless of the limitations, the basic integrated principles can still be applied. Integrated design in existing buildings is a fertile field with many challenges, but there are already good practice examples from which much can be learned.

Taking state of the art to scale

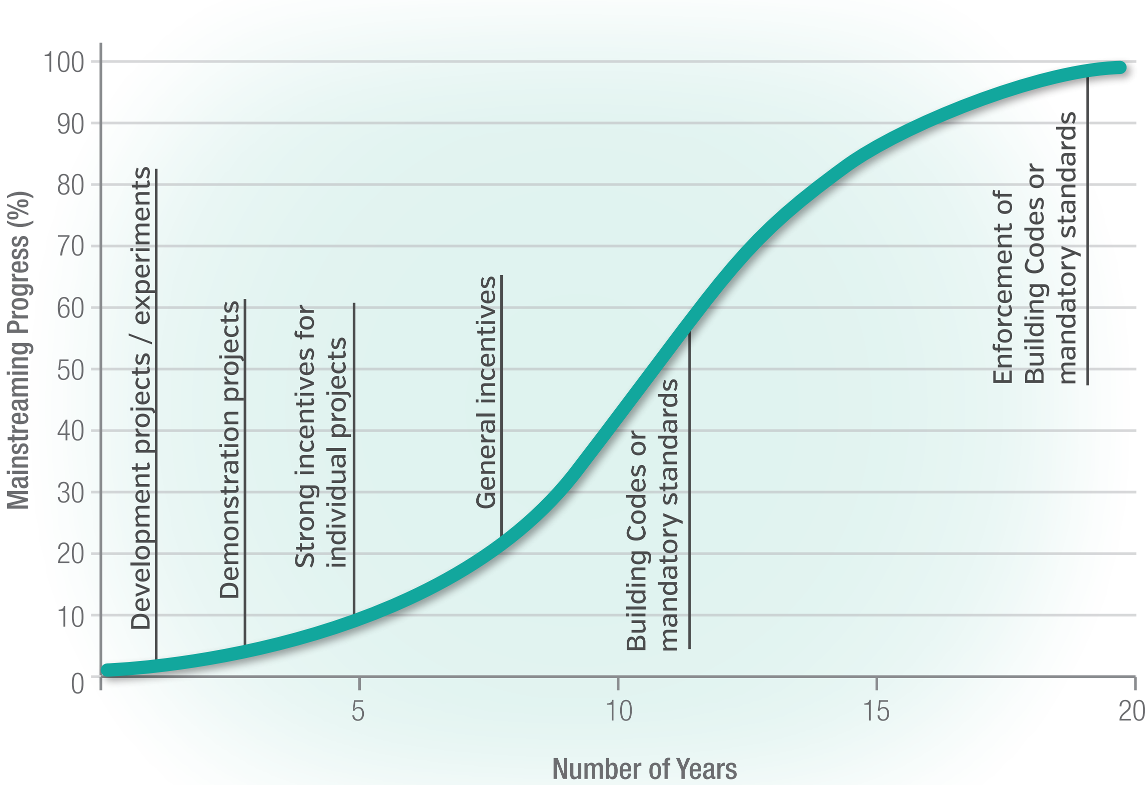
A key challenge in delivering the Deep Path is to gradually upscale state of the art from a small fraction of buildings to become the norm for new construction and renovation. Experience shows that scaling up new technology takes time and considerable effort – it can easily take two decades even within a supportive policy framework (see Figure 6).

Best-Practice Policies for New Buildings

Some of the best policies today have started to integrate state of the art in new construction at a larger scale (see Figure 7). In Austria and Germany,

FIGURE 6

Time Taken to Scale-up and Mainstream Better Buildings

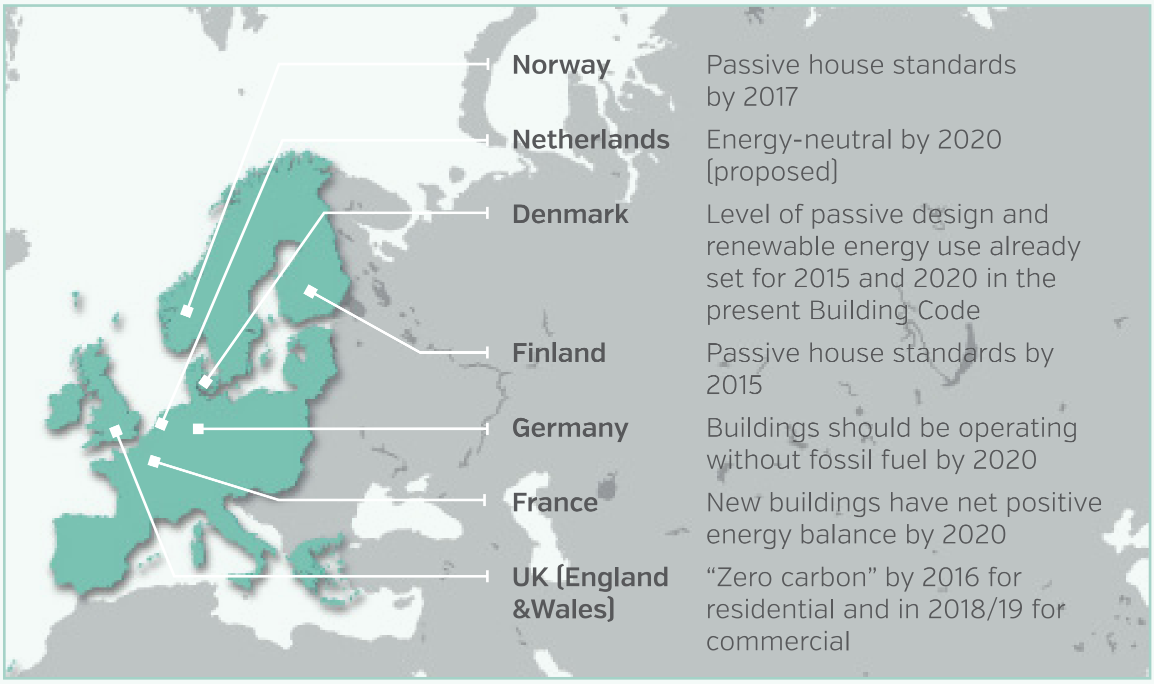


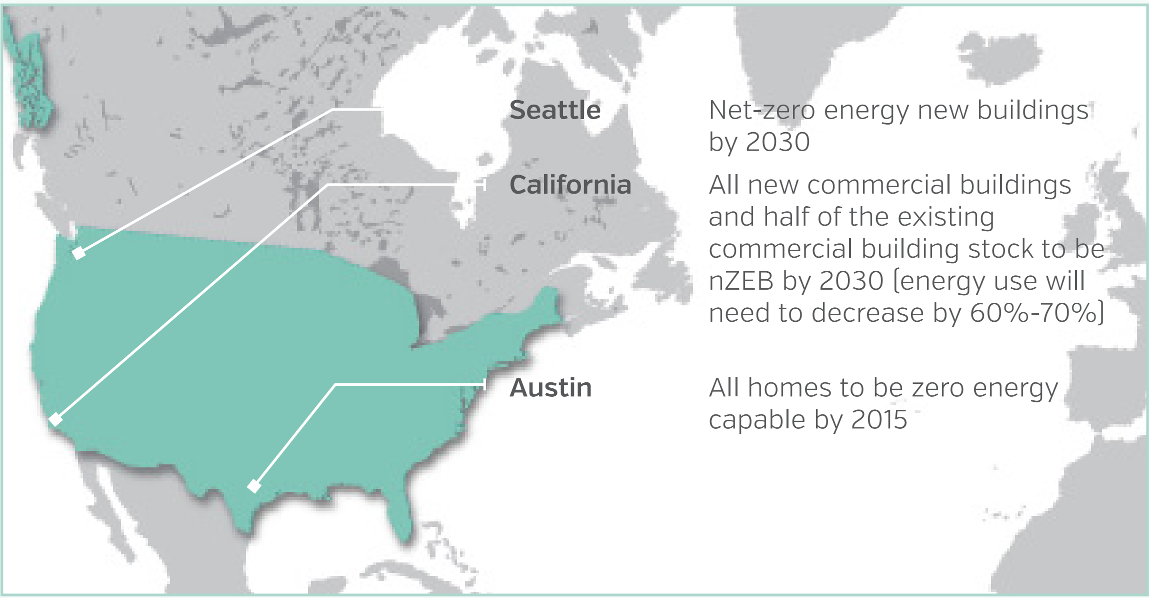
Source: GBPN

FIGURE 7

Best Practice Policies in the EU and the US - Some Examples

Some of the most advanced and dynamic building codes are beginning to target energy efficiency for new buildings. A few key examples are noted below.





Source: GBPN

policy packages have been supporting passive house design for the last decade. As a result, passive houses account for approximately 25% of new construction. In some Austrian states, this percentage is even higher and passive house design has been integrated in the general policy framework.

Best-Practice Policies for Existing Buildings

Existing buildings need a package of measures that drive Deep renovation and ensure that these are scaled up to become mainstream. Examples of state-of-the-art building renovation or refurbishment can be found in all regions of the world, especially in North America and Europe.

As an extension of earlier projects and campaigns, the EU has mandated its member countries to develop roadmaps for Deep renovation as well as to renovate 3% annually of central government buildings to a high energy performance level.

One of the best practice examples on Deep renovation is the KfW programme in Germany. This programme has been able to upscale Deep renovation of existing residential buildings. The measures include multiple policies and supporting measures of which finance is a key element.

The bottom line – is it affordable?

The GBPN studies have shown that the required technology and techniques for the Deep Path are there, but do they make financial sense? New passive buildings have already been built with minimal incremental cost over standard techniques, and those costs are coming down as experience is gained and lessons are learned. Getting such buildings to be the norm will have a significant impact on costs.

Deep renovations are more expensive the more ambitious they are. A 2011 study by the GBPN EU Hub, BPIE, showed that there was a wide range of costs for Deep retrofits in Europe, ranging from €50/m^2 to €800/m^2, although most are in the range of €200-300/m^2.[12] These costs will decrease once a better understanding and more experience on taking Deep retrofits to scale have been gained.

12 BPIE, *Under the Microscope*, op.cit., p. 102.

The higher costs can be justified in a couple of ways. First, considering a life-cycle approach over the lifetime of the building, the Deep retrofit pays for itself via the accumulated cost savings. Second, considering the bigger societal perspective, the higher costs of Deep renovations can be justified since overall energy reduction goals are societal goals with global benefits.

Priorities

Ensuring that a Deep Path is followed requires the reconciliation of various elements, including:

- Consensus on long-term energy savings and CO_2 emissions reduction targets at national/regional levels and internationally;
- Consensus that the buildings sector has to contribute to energy consumption reduction targets, implemented through ambitious, long-term policy frameworks;
- Agreement that best practice cases exist that demonstrate the existence of technologies and techniques that could achieve a Deep efficiency pathway;
- Acknowledgement that best-practice policies need to be better developed and shared, integrating the lessons learned ; and
- Acknowledgement that business as usual is not sufficient and that a major shift in mindset to truly think Deep is necessary.

Thinking Deep and transformational policies will mean different things to different people and different regions. Gaining the needed consensus will require more global dialogue and understanding of what it takes to be on the Deep Path.

> *Considering a life-cycle approach over the lifetime of the building, the Deep retrofit pays for itself via the accumulated cost savings. Considering the larger societal perspective, the higher costs of Deep renovations can be justified since overall energy reduction and climate protection goals are societal goals with global benefits.*

CHAPTER FIVE

MANAGING THE DEEP TRANSFORMATION

Managing transformation is different than managing business-as-usual. It means taking a more integrated approach through ambitious goal setting, the development of a long-term policy framework and strong commitment from all stakeholders. It requires an acceptance by policymakers that the buildings sector has a fundamental role to meet our energy and climate strategies. But it can be done even with today's solutions and buildings based on existing best practice policies. And it requires stakeholders in the buildings sector to have the confidence to take that Deep step.

Public sector institutions have the leading role in designing a policy framework that can lead to the realisation of the maximum possible energy savings. Governments' commitment and new thinking must drive the development of state-of-the-art building energy performance policies. At the same time, policymakers may have concerns that an ambitious Deep energy savings and efficiency path will be laden with a level of complexity that will be beyond the capacity of most administrations. However, an appropriate level of commitment, organisation and long-term planning should work to overcome this perceived barrier.

How can the Deep Path be implemented?

The implementation of the Deep Path lies on four key elements:

1. Documenting the Transformation
2. Ensuring Stakeholders' Engagement
3. Developing the Right Policy Framework
4. Following a Precise Agenda
5. Monitoring & evaluation of impacts

1 DOCUMENTING THE TRANSFORMATION

The development of Deep Path policy roadmaps will require building up knowledge on:

- How the policy framework (including building codes) needs to evolve;
- How policies will be implemented (including compliance requirements) over the long-term;
- The availability of financing;
- GHG reduction targets;
- Potential co-benefits of building energy performance such as economic growth, job creation, or health and thermal comfort);
- How innovative technologies (including renewable energy) will play a role in improving the energy performance of buildings.

2 ENGAGING ALL STAKEHOLDERS IN THE DEEP PATH

Stakeholder engagement is essential to lay the foundation for implementing the Deep Path. There is a need for all parties involved in the building sector to work together more closely and agree on a detailed implementation strategy that enables the transformation towards a systems-based building design and construction approach.

A market transformation of the building sector needs to be based on ambitious long-term targets and on packages of policies that drive innovation and put energy efficiency high on the agenda in new construction and renovations.

3 DEVELOPING THE RIGHT POLICY FRAMEWORK: POLICY ROADMAPS

Upscaling of energy efficiency in buildings requires the development of a comprehensive package of measures that facilitates a change from prescriptive thinking into a more systems-based approach, as described in Chapter 4.

The most effective way to develop an effective policy framework is through the implementation of a policy roadmap, where ambitious long-term targets are supported by actions planned along the entire implementation process. Roadmaps should also include realistic milestones to be achieved both in the short and mid-term.

The effectiveness of policy package elements can be increased by addressing existing and new buildings separately.

The following pages describe policy roadmaps in more detail.

The GBPN supports:

→ the implementation of policy packages based on this new approach in all parts of the world. We promote the development of state-of-the-art policies that are backed by strong policy ambition to up scale energy efficiency of the whole building stock.

→ the elaboration of two different sets of roadmaps to address energy efficiency in new construction and for reduction of energy use in the existing building stock in different regions and climates.

MANAGING THE DEEP TRANSFORMATION

New buildings will have to move ***towards being positive energy buildings*** meaning that their energy and carbon footprints will be zero or positive. Experience shows that net zero energy buildings or at least buildings with minimal CO_2 emissions can be rolled out to scale in all regions at minimal cost increases, if the policy commitment is there.

Energy efficiency building codes are a core element in a policy package for new buildings, but these need to be supported by an array of measures. These measures must ensure that new construction is based on integrated and bioclimatic design supporting the use of passive energy and the incorporation of renewable energy in buildings.

Focusing on costs over the building life cycle
This approach should ensure economic optimisation of the policy measures. Life-cycle costs should be taken into consideration.

Adopting a holistic approach to building design
Based on passive and bioclimatic design – first, reducing the energy needs of the building and second, ensuring efficient supply of energy and optimised use of renewable energy.

Encouraging the use of renewable energy
Encouraging passive and active strategies for integrating renewable energy.

Setting targets towards reaching net zero energy
The building energy target must be set as an absolute target rather than a relative target; energy efficiency codes for new buildings will ensure that energy efficiency becomes the norm and will cover most new buildings.

Focusing on the overall performance of buildings
Considering a building as a system rather than as individual separate parts or energy supply systems.

POLICY ROADMAPS FOR NEW BUILDINGS

A ***best practice policy package*** for positive energy buildings will establish the standard minimum level for new buildings and also encourage ambitious performance of new buildings that go beyond the minimum, and set conditions so that energy efficiency becomes a competition factor for new construction, through:

Supporting buildings that go beyond minimum requirements

Energy efficiency demands (green rating schemes etc.) should support buildings to go beyond the minimum requirements in order to drive innovation and develop new and cost effective solutions. Public buildings must demonstrate this for other new constructions.

The development of ambitious building codes

Increasing the stringency of performance requirements with a target of mandating zero energy, zero carbon or energy positive buildings as standard by 2022.

Evaluation and assessment of impact

A system that measures the impact of the policy is needed to enable continuous adjustments and improvements to be made.

A package to support the requirements in building codes

A package of incentives, financing systems, information and training activities that support demonstration projects and the scaling-up of buildings going beyond minimum performance, as well as the overall development of codes encouraging 'zero' energy to become the standard.

Proper implementation and enforcement

Effective implementation and enforcement of these ambitious building energy efficiency codes are needed to ensure that the full savings potential of new buildings is achieved.

MANAGING THE DEEP TRANSFORMATION

Deep energy efficiency roadmaps for existing buildings will include an increased rate of Deep energy improvements in the existing building stock. For existing buildings there is a need for a combination of policy measures that can overcome potential barriers and encourage energy efficiency.

Public buildings should lead the way

Strong commitment and demands for existing public buildings can lead the way for other stakeholders and can help to develop and demonstrate Deep renovation. The public sector should increase the rate of renovation and undertake Deep renovation whenever possible.

Development of demonstration projects

Encouraging demonstration projects and up scaling of Deep energy renovation of buildings (where energy consumption is reduced by 75 % or more). The aim is to reduce consumption on average for a building; this might include replacement of some buildings with new constructions, if this is optimal.

4 FOLLOWING THE DEEP PATH AGENDA:
A transformational change for all buildings in the next decade

Delivering the Deep Path by 2050 implies making today's leading state of the art practices in each region the standard for all buildings in 10 years time. Deep energy efficiency roadmaps for new buildings would include policies for achieving Positive Energy Buildings using passive and bioclimatic design approaches. The remainder of energy demand would then optimally be supplied by renewable and sustainable energy sources. Deep energy efficiency roadmaps for existing buildings would include an increased rate of Deep energy improvements in the existing building stock.

In their development and adoption, policy roadmaps clearly need to take into account vastly different local conditions, such as the climate, experience and depth of the construction sector, and regulatory environment.

POLICY ROADMAPS FOR EXISTING BUILDINGS

Innovative Financing Systems

The rate of improvements of buildings including energy efficiency has to be increased and more buildings need to be refurbished every year. Incentives and new financial bundling that encourage Deep energy renovations need to be implemented. Revolving funds and regulation can help to overcome key barriers such as split incentives and incremental costs or lack of capacity.

Awareness raising mechanisms

Increasing awareness of low energy solutions through certification, labelling, disclosure and individualised advice. Such efforts support the business case for state-of-the-art building energy performance investments and give confidence to owners to undertake such investments.

Upscaling state-of-the-art projects

The Deep Path will work on scaling up state of the art, first from demonstration to larger scale of individual buildings, then into scale of best practice, increase market uptake and finally working towards a full implementation.

Mandatory Requirements

Policies should mandate certain minimal amount of energy savings in percentage difference before and after renovation.

Training and Education Programmes

Policy packages should define appropriate means to transfer knowledge along the value chain.

Documented Savings

Energy use should be measured, metered and documented after the renovation.

5 MONITORING AND EVALUATING IMPACTS

Policies should be well monitored, evaluated, their impacts assessed, and adapted as needed to ensure maximum effectiveness.

CHAPTER SIX

RENEWING GLOBAL DIALOGUE

There are many ways to improve energy security, attain a more sustainable energy system and mitigate GHG emissions. There is growing consensus that the buildings sector can play a significant role to achieve these goals, and that energy performance in buildings should have a higher priority in our energy and climate change policies.

Buildings for Our Future has been published to initiate a new dialogue on the role of improved energy performance of buildings in today's global and national policy discussions. The current best practice policies in buildings are not sufficient to support the reduction of global GHG emissions from the building sector. Stronger building performance policies can reduce energy demand or associated CO_2 emissions in support of keeping the global average temperature from exceeding 2°C. *Buildings for Our Future* demonstrates the mitigation potential of the building sector and uncovers the long-term risk of locked-in energy inefficiency.

Quick action is needed to start the process of mainstreaming state-of-the-art policy and practice and building performance if the Deep Path's 2050 targets are to be achieved. This will require decision makers in all GBPN regions to understand the benefits of not only "thinking" Deep, but also of "acting" Deep through their policymaking. Current policy frameworks need to be transformed to reflect the urgent need for GHG emission reductions. Part of that transformation is in the attitudes and commitment of decision makers.

Key Priorities to Move Forward

- *Need to increase networking and sharing of best practice on a global scale*
- *Need for more policy evaluation, more monitoring, better data collection and better sharing on implementation issues such as compliance*
- *Need to manage transformation by taking a more integrated approach through ambitious goal setting, the development of a long-term policy framework and strong commitment from all stakeholders*
- *Need to gain the acceptance of policymakers that the buildings sector has a fundamental role within energy and climate strategies and ambitious targets can be met by building on existing best practice policies, techniques, technologies and approaches.*

The Global Buildings Performance Network [GBPN] is a globally organised and regionally focused network whose mission is to advance best practice policies that can significantly reduce energy consumption and associated CO_2 emissions from buildings.

Achieving the reforms detailed in *Buildings for Our Future* requires strategic planning and collaboration, as well as a more holistic and comprehensive approach to individual buildings and to how policies are developed and implemented. The Deep Path strategy provides a common platform for collective and coordinated action to achieve the energy saving and CO_2 mitigation potential of buildings.

→ *GBPN wishes to facilitate a wide collaboration to implement this global strategy for the building sector and accelerate the transformation.*

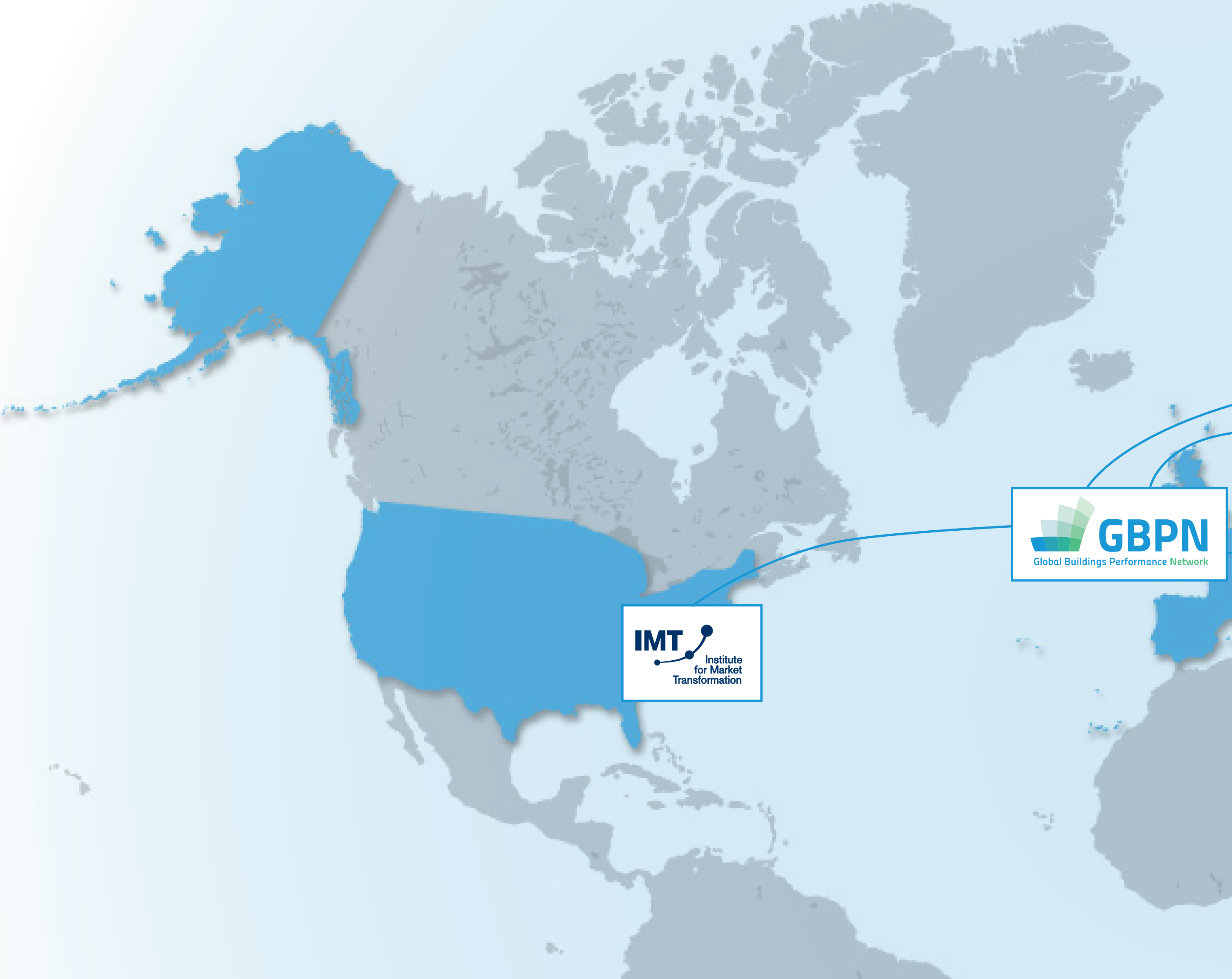
Despite vast regional differences, all GBPN regions need new and revised policy packages that will enable Deep savings to be realised. Though implementing the Deep approach will take place at different speeds, the specific characteristics of each region nonetheless show that it is feasible, manageable and necessary.

→ *GBPN undertakes activities that offer the greatest achievable CO_2 mitigation and energy savings via its hubs and partners in the regions.*

Starting down the Deep Path will require more effective collaboration amongst all stakeholders in the building sector both globally and regionally to push for ambitious energy performance gains. There is a need for greater sharing of best practice in order to learn from each other.

→ *The GBPN is already playing a catalytic role through best practice policies sharing and analytics.*

OUR GLOBAL NETWORK



The Institute for Market Transformation (IMT) is a Washington, DC-based nonprofit organisation dedicated to promoting energy efficiency, green building, and environmental protection in the United States and abroad. Much of IMT's work addresses market failures that inhibit investment in energy efficiency.

www.imt.org

The Buildings Performance Institute Europe (BPIE) is a European not-for-profit think-do-tank, delivering policy analysis, advice and implementation support. Its focus is knowledge creation and dissemination for evidence-based policy making in the field of energy performance in buildings. The Brussels-based institute, in operation since February 2010, is the European Hub of the Global Buildings Performance Network (GBPN).

www.bpie.eu & www.buildingsdata.eu

GBPN
Global Buildings Performance Network

The Global Buildings Performance Network (GBPN) is a globally organised and regionally focused non-profit network advancing building energy performance best practice policies to help decision-makers develop and implement policy packages that can deliver a Deep Path of energy consumption reductions and associated CO_2 emissions mitigation from buildings. It operates a Global Centre in Paris and is officially represented by Hubs in China, Europe, India and the United States.

www.gbpn.org

SHAKTI
SUSTAINABLE ENERGY FOUNDATION

The GBPN works closely with its Indian partner, the Shakti Sustainable Energy Foundation's Buildings Programme (SHAKTI) to run an Indian programme that supports the Government's Energy Conservation Building Code (ECBC) to ensure that 90% of all applicable commercial buildings are ECBC compliant by 2030. We are also focusing on the development of performance guidelines for urban residential buildings. Shakti's mission is to catalyse innovative policy-packages that encourage energy efficiency and the development of newer energy sources.

www.shaktifoundation.in

THE CHINA SUSTAINABLE ENERGY PROGRAM
Toward a Sustainable Energy Future for the People's Republic of China

In partnership with The China Sustainable Energy Programme (CSEP) in Beijing, the GBPN Chinese programme aims to provide a common platform to identify and translate Chinese best practices for global dissemination, facilitate Chinese and international knowledge exchange and capacity building and support Chinese institutions to identify and achieve the abatement potential of the building sector in China.

www.efchina.org/FHome.do

Policy Paper
June 2013

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