GBPN
Global Buildings Performance Network

Building Policies for a Better World

Annexes & Data Series

ROBUST BUILDING DATA: A DRIVER FOR POLICY DEVELOPMENT

February 2013

ANNEX 1 – THE 'DEEP' SCENARIO

The "deep" scenario designed by the Central European University, found in the Report: "Best Practice Policies for Low Carbon & Energy Buildings, report 2012, commissioned by GBPN."

Deep Scenario

This scenario demonstrates how far today's state-of-the-art construction and retrofit know-how and technologies can take the building sector in reducing energy use and CO_2 emissions, while also providing full thermal comfort in buildings. In essence, the CEU determine the techno-economic energy efficiency potentials in the building sector.

In this scenario, exemplary building practices are implemented worldwide for both new and renovated buildings (with an accelerated retro fit rate of 3%). Over the 10-year period from 2012 to 2022 "advanced" buildings[14] are widely proliferating in all regions, replacing conventional new and retrofit buildings on the market. The transition period allows markets and industries to prepare for the large-scale deployment of the high efficient building construction technologies, materials and know-how.

Necessary ambitious enabling policies can also be implemented and the vital supporting institutional framework introduced. After 2022, most renovations and newly built structures will be of a very high-energy efficient design as exemplary buildings in the same (or a similar) climate zone.

[14] Advanced buildings, according to the model's logic, have a state-of-the-art design, which allows for a significant reduction of thermal energy demand in most climate zones (up to 90%). This assumption is also in line with the concept of a passive house, which often does not include any "active" heating or cooling systems, with the usual energy performance for space heating and cooling presented at the level of 15 kWh/m^2 year in final energy. However, advanced buildings considered in this study are incorporated in a broader concept, as they include any high efficient buildings, regardless energy efficiency measures (e.g. "passive" or "active" heating system), but with very low level of thermal energy use.

ANNEX 2 – MATRIX: ALL REGIONS

Residential and commercial & public and building energy use subsections

	US	Percentage	EU	Percentage	CHINA	Percentage	INDIA	Percentage
Highly reliable data	23	77%	8	27%	6	20%	1	3%
Data available with minor uncertainty	7	23%	12	40%	11	37%	10	33%
Partial Data with major uncertainty	0	0%	5	17%	6	20%	10	33%
Uncertain data	0	0%	5	17%	7	23%	9	30%
Total	30	100%	30	100%	30	100%	30	100%

Figure 2.1. Four Regions Data Split into Reliability Groups.

	Floor Area (m^2)	No. of Buildings	Energy Use	Heating	Cooling	Hot Water	Lighting / Apps	Age Profile	Retrofit Rates	Urban / Rural Split	New Build Energy Use	New Construction (m^2/a)	Fuel Mix	Ownership (Private /Public)	Tenure
US - Residential	5	4	4.5	4.5	4	4	4	3.5	3	3.5	3.5	5	4	4	4
US - Commercial & Public	5	5	5	4	4	4	4	4	4	2.5	3.5	5	3.5	4	4
EU - Residential	4.21	4.916666667	3.83	3.9166667	2	3.1666667	3.17	4.16666667	1.83	3.13	3.67	3.75	4.00	2.58	3.83
EU - Commercial & Public	3.38	2.666666667	2.83	2.9166667	1.416667	2.6666667	1.17	1.91666667	1.167	0.75	3.17	2.33	3.33	0.83	1.17
CHINA - Residential	3	2	4	4	3	3	2	2	3.5	3	4	4	4	0	0
CHINA - Commercial & Public	3	2	3.5	3.5	3	2	2	0	3	1	4	0	3.5	0	0
INDIA - Residential	2.5	0	3	2	1.5	3	2	0	2	3.5	2	0	2.5	0	0
INDIA- Commercial & Public	2.5	0	3	2	2	2	3	0	2	4	2.5	2	3	0	

Figure 2.2.. Four Regions Data, Weightings are Colour Coded According to Accuracy Groups.

ANNEX 3 – EU-27 DATA QUALITY SPREADSHEEET

The countries shaded in grey are those used to calculate the EU-27 average data quality.

EU		Floor Area (m^2)	Number of Buildings	Energy Use ($kWh/m^2.a$)	Heating	Cooling	Hot Water	Lighting	Can you split by Age Profile?	Retrofit Rates	Urban/Rural Split	NEW BUILD Energy Use ($kWh/m^2.a$)	NEW Construction (m^2/a)	Fuel Mix	Ownership	Tenure	AVERAGE
	EU Average	3.9	3.1	2.7	2.5	1.7	1.7	2.2	3.2	1.4	2.0	3.1	3.0	3.3	2.6	1.7	**2.6**
GOOD	**France**	5.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0	2.0	3.5	4.0	5.0	4.0	4.0	2.0	**3.8**
GOOD	**Lithuania**	5.0	5.0	4.0	3.0	3.0	3.0	3.0	3.0	2.0	5.0	4.0	4.0	4.0	5.0	2.5	**3.7**
GOOD	**Netherlands**	4.0	4.0	3.5	3.5	3.5	3.5	3.5	2.5	2.5	5.0	4.0	4.0	3.5	4.5	2.0	**3.6**
ABOVE AVERAGE	**Latvia**	5.0	5.0	3.5	4.0	4.0	0.0	4.0	5.0	4.0	5.0	2.0	5.0	2.0	4.0	0.0	**3.5**
ABOVE AVERAGE	**Finland**	5.0	3.5	4.0	4.0	4.0	4.0	4.0	5.0	2.0	0.0	3.0	2.0	4.0	4.0	2.0	**3.4**
ABOVE AVERAGE	**Bulgaria**	4.5	3.5	4.5	3.5	3.0	3.5	3.5	4.0	0.0	2.5	4.0	2.5	3.5	3.5	3.0	**3.3**
ABOVE AVERAGE	**Czech Republic**	4.5	3.5	4.0	3.0	3.0	3.0	3.0	4.5	2.0	2.0	4.0	3.0	3.0	2.5	2.0	**3.1**
ABOVE AVERAGE	**Sweden**	5.0	5.0	3.0	4.0	2.5	4.0	2.5	2.5	2.0	1.5	4.0	4.0	4.0	1.5	1.5	**3.1**
ABOVE AVERAGE	**UK**	4.0	3.5	4.0	4.0	1.0	2.0	3.0	4.0	1.0	2.0	4.0	3.5	4.0	3.0	2.0	**3.0**
ABOVE AVERAGE	**Romania**	4.5	2.5	4.0	3.0	3.0	3.0	3.0	2.5	0.0	2.5	3.0	2.0	4.0	3.5	2.5	**2.9**
ABOVE AVERAGE	**Slovenia**	5.0	2.0	3.0	2.5	2.5	2.3	2.5	5.0	2.0	2.5	4.0	5.0	2.0	2.0	0.5	**2.9**
ABOVE AVERAGE	**Italy**	3.5	5.0	1.5	2.5	2.5	2.5	2.5	4.0	3.0	1.0	4.0	3.0	4.0	2.0	1.0	**2.8**
ABOVE AVERAGE	**Germany**	4.5	3.0	4.5	2.5	0.0	0.0	2.5	2.5	3.0	0.0	4.0	5.0	4.0	0.0	4.0	**2.6**
	EU Average	3.9	3.1	2.7	2.5	1.7	1.7	2.2	3.2	1.4	2.0	3.1	3.0	3.3	2.6	1.7	**2.6**
	Spain	5.0	2.5	3.0	3.0	3.0	3.0	3.0	2.0	1.0	2.5	0.0	2.0	5.0	0.0	2.5	**2.5**
BELOW AVERAGE	**Hungary**	4.0	4.0	2.5	3.0	0.5	0.0	3.0	3.5	1.0	2.0	4.0	2.0	2.5	3.0	2.5	**2.5**
BELOW AVERAGE	**Estonia**	4.0	2.5	2.0	2.0	0.0	0.0	2.0	5.0	0.0	2.5	4.0	5.0	5.0	2.5	0.0	**2.4**
BELOW AVERAGE	**Denmark**	4.5	2.5	2.5	1.0	1.0	1.0	1.0	3.0	0.0	0.0	4.0	5.0	5.0	5.0	0.0	**2.4**
BELOW AVERAGE	**Austria**	3.0	3.8	2.0	2.0	0.0	0.0	0.0	2.5	1.5	3.8	4.0	1.8	4.0	3.8	3.0	**2.3**
BELOW AVERAGE	**Belgium**	4.5	3.5	2.5	1.5	0.0	1.5	0.0	3.5	3.0	2.5	3.0	3.0	2.5	2.0	2.0	**2.3**
BELOW AVERAGE	**Slovakia**	4.5	2.0	3.0	3.0	3.0	0.0	3.0	4.5	0.5	0.0	4.0	1.0	3.0	2.0	1.5	**2.3**
BELOW AVERAGE	**Poland**	2.5	5.0	2.0	2.0	2.0	2.0	2.0	1.5	0.5	1.5	4.0	2.0	2.5	2.0	2.0	**2.2**
POOR	**Greece**	4.0	4.0	1.0	2.5	0.0	0.0	2.5	4.0	0.0	4.0	0.0	0.0	2.0	4.0	2.5	**2.0**
POOR	**Portugal**	1.5	1.0	3.5	1.5	1.5	1.5	1.5	1.5	2.0	0.0	4.0	4.5	3.5	1.0	0.0	**1.9**
POOR	**Malta**	2.5	1.5	2.0	2.0	2.0	2.0	2.0	2.5	0.0	0.0	1.0	1.5	2.0	2.0	2.0	**1.7**
POOR	**Ireland**	2.5	3.0	0.0	0.0	0.0	0.0	0.0	2.5	0.5	1.5	4.0	2.0	4.0	2.5	2.5	**1.7**
POOR	**Cyprus**	4.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	3.0	1.0	1.0	2.0	1.5	**1.4**
BAD	**Luxembourg**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	3.5	0.0	0.0	**0.5**

Figure 3.1. Data Quality of EU-27 Member States.

ANNEX 4 - BEST PRACTICE CASE STUDIES

California

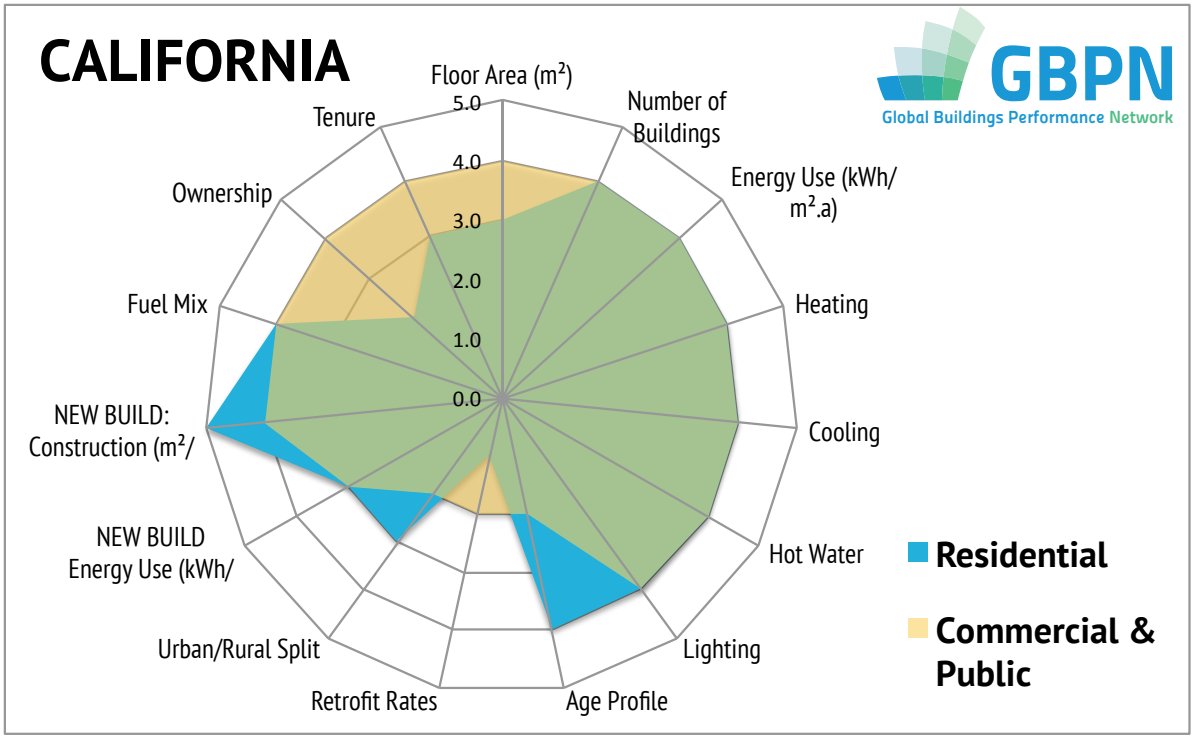

Figure 4.1. California Residential vs. Commercial Building Data Quality.

California stands in front in the depth of state-specific energy consumption data of commercial buildings. It has an exceptional wealth of energy consumption data thanks to the California Commercial End-Use Survey (CEUS) that is prepared for by the energy commission. The California Energy Commission's consultant report describes the purpose in more detail…

"The California Commercial End-Use Survey (CEUS) is a comprehensive study of commercial sector energy use, primarily designed to support the state's energy demand forecasting activities. Itron performed the survey under contract to the California Energy Commission. The survey captures detailed building systems data, building geometry, electricity and gas usage, thermal shell characteristics, equipment inventories, operating schedules, and other commercial building characteristics.

A stratified random sample of 2,800 commercial facilities was targeted from the service areas of Pacific Gas & Electric, San Diego Gas and Electric, Southern California Edison, Southern California Gas Company and the Sacramento Municipal Utility District. The primary sampling unit was the premise, defined as a single commercial enterprise operating at a contiguous location. The sample was stratified by utility service area, climate region, building type, and energy consumption level.

Specialized software developed for the CEUS project generates energy simulation models automatically from the on-site survey data. Simulated energy use for each survey participant was calibrated to actual historical energy consumption from utility billing records. The software creates end-use load profiles and electricity and natural gas consumption estimates by end-use for user-defined commercial market segments. Its capabilities allow evaluation of energy efficiency measure installation, energy rate schedules, weather parameters, and many other scenarios against baseline usage patterns or conditions.

For each utility service area, floor stocks, fuel shares, electric and natural gas consumption, energy-use indices (EUIs), energy intensities, and 16-day hourly end-use load profiles were estimated for twelve common commercial building type categories." (CEUS, 2013).

France

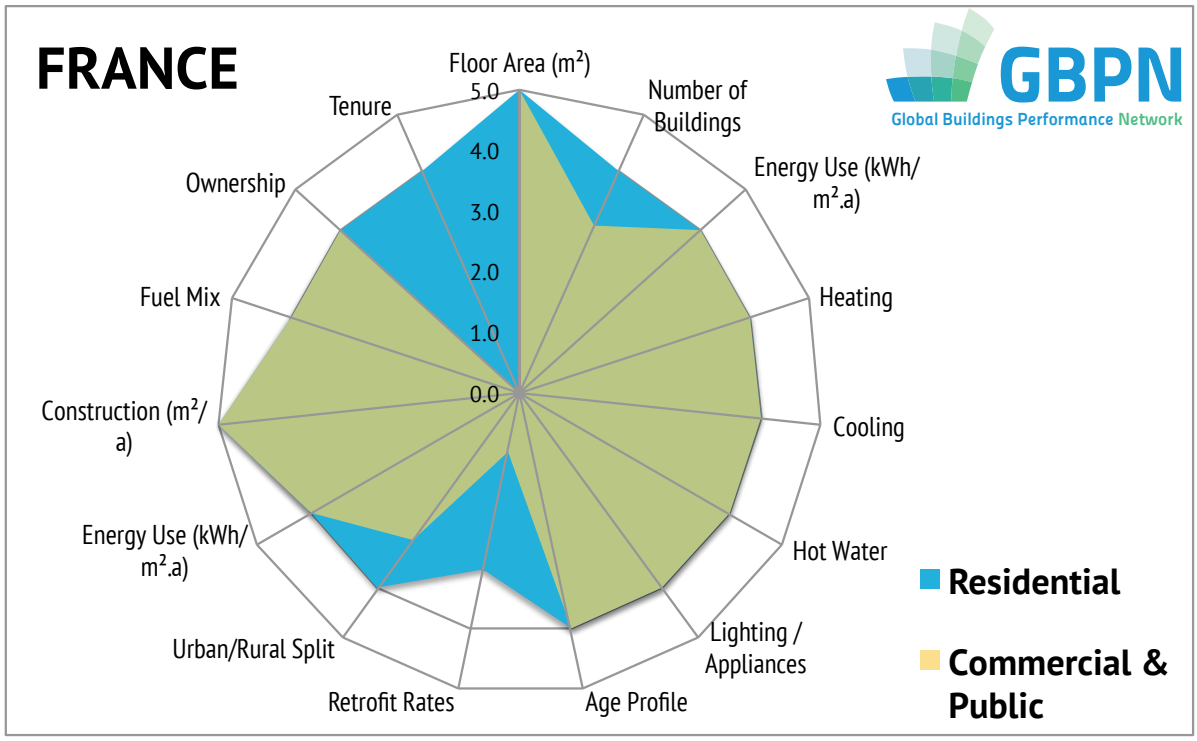

Figure 4.2. France Residential vs. Commercial Building Data Quality.

The French template is an example of best practice data collection. Building performance data collection in France is coordinated by the French Agency for Environment and Energy Management (ADEME).

ADEME is one of largest, best-funded and longest established energy agencies in the EU. It also has a national perspective covering the whole of France, which is often not the case in other countries with federal structures. ADEME has an experience base that covers all sectors, which means they have built up a good knowledge base across most dimensions of building energy efficiency – residential & non-residential. ADEME also coordinates the SAVE Program of the European Commission and within this a project called ODYSSEE. ODYSEE is a project that aims to monitor energy efficiency policies across whole Europe. ADEME explains that…

"In order to monitor and compare energy efficiency progress achieved in Europe a coordinated approach is required:
Accurate energy efficiency indicators, harmonised between the different countries covered: these are provided by the SAVE / ODYSSEE project. A database covering energy efficiency policies in Europe: this is provided by the MURE (Modèles d'utilisation rationnelle de l'énergie) project. A cross-referencing of these two tools, linking energy policy to energy indicators.

ODYSSEE aims to establish and produce energy efficiency indicators for the various sectors of the economy (industry, transport, etc.) with a detailed breakdown by usage: heating, cooking, domestic hot water, household appliances, etc. The aim is to set up a permanent technical structure to monitor annual sectorial progress in energy efficiency and CO2 emissions, nationally and at the European level. Around 150 energy efficiency indicators are calculated in the ODYSSEE database for 27 EU countries plus Norway and Croatia." (ADEME, 2013).

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About GBPN

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.