INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

WMO UNEP

IPCC Fourth Assessment Report

Expert/Government Review of the Second-Order Draft

Chapter 6

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-1	A	0	0	0	0	describing building energy losses via diagram. Lack of information about energy requirement for heating and cooling, and both (NOIM UDDIN, Macquarie University, Sydney)	Noted: we added Figure 6.3 which illustrates the breakdown of residential and commercial energy use in one developed country and one developing country. However, we cannot do the same for wasted energy.
6-2	A	0	0	0	0	Many techniques on mitigation illustrated in this chapter are very useful and practical. However, due to space limit, the description of the techniques should be reduced to a more compact format by removing additional technical details. (Di Hongfa, Tsinghua University)	Accepted: we revised and shortened too technical details throughout the section 6.4. on mitigation options.
6-3	A	0	0	0	0	In buildings sector especially in developing countries integration of mitigation options in urban planning programmes needs to be highlighted or told explicitly given the income growth and construction boom. (Joyashree Roy, Jadavpur University)	Accepted: this point is added to the section 6.4.1. 7. (Consider building for, orientation, and related attributes).
6-4	A	0	0	0	0	There was a request for more precise information on cost effectiveness of energy efficiency measures. Ancillary benefits should be quantified better, and the chapter should state more precisely the (range of) discount factors used in evaluating the investments. (Expert Review Meeting Paris, IPCC)	Rejected: we have provided the full information on cost-effectiveness of options in section 6.5 (potentials and costs for GHG mitigation). Discount rates used were listed in the chapter. Accepted: the literature on quantitative effects of ancillary benefits was reviewed and integrated where possible.
6-5	A	0	0	0	0	The substantial negative costs reported in this chapter raised the question if the chapter should not pay more attention to the implementation barriers, probably differentiated between residential and commercial. (Expert Review Meeting Paris, IPCC)	Rejected due to space limitations.
6-6	A	0	0	0	0	Some fine tuning with chapter 13 might be necessary with regard to the effectiveness statements on measures in the buildings sector. (Expert Review Meeting Paris, IPCC)	Accepted: we checked Chapter 13 for this subject.
6-7	A	0	0	0	0	While the IPCC Special Report on F-gases does cover emissions from the building sector, it is inadequate because its time horizon is 2015. At a minimum, it projections should be extrapolated to 2030, and mitigation potential and cost for this significant source of emissions added to the overall total. (Lenny Bernstein, L. S. Bernstein & Associates, L.L.C.)	Rejected: no information sources available to go beyond 2015, we clarified that we only cover until 2015.
6-8	A	0	0	0	0	This draft of chapter6 looks like a beginners' text book without figures and tables. If	Rejected due to space limitations.

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						possible, for example system flow chart of the HAVC, or Section of a house explaining elements of thermal envelope etc, with visual information is better to understand. (Yutaka Tonooka, Saitama University)	
6-9	A	0	0	0	0	Quotation policy is not unified within the authors. This book ought to consist of quotation. Some part was insufficient showing information sources. (Yutaka Tonooka, Saitama University)	Noted: we made an attempt to improve the reference stile.
6-10	A	0	0	0	0	Very good chapter with overall message clearly coming out (i.e. mitigation potentials in the building sector is huge). This being said, I have concerns over the way some issues are presented: as if they should be taken for granted when they are in fact still debated. The two main issues that I will illustrate with specific examples from the chapter are i- issues of evaluation and cost/benefit analysis (and most particularly on the quantification of co-benefits); ii- the importance of the financial barrier in the mitigation process of the building sector is a little bit downplayed; and particularly the role to be played by the public sector. On another issue: thought too much time was spent on the technical part which overall does not bring much value added. Typically think the chapter would highly benefit from more debate on issues mentioned above. By contrast, less time should be spent on the technical details which could be dealt with in the annex. (Philippine de T'Serclaes, International Energy Agency)	Noted: we located more references on quantitative effects of co-benefits and added to the related section. We made an attempt to put more emphasis on the financial barrier in the section on barriers to adopting buildings technologies. Accepted: we reduced the detailed of technological discussion.
6-11	A	0	0	0	0	The national communications of annex-I parties have a substantial coverage of policies and measures for various sectors - including residential and commercial buildings. These provide excellent literature source for mitigation options where the respective governements are taking actions and/or considering for action. These reports go through a comprehensive QA/QC process and third party review process through UNFCCC. These are therefore excellent literature source. UNFCCC also compiles synthesis reports from these documents. Surprisingly, chapter 6 does not take these reports into cognizance at all. Some non-annex-I countries have also covered this theme is their national communications. It is suggested that the chapter include these reports in reference and their conclusions in the text appropriately. (Government of India)	Accepted with the observation of space limitations: we reviewed national communications and included some references into the section on potential and costs of GHG mitigation. However, we did not find much to add to Table 6.5 (now 6.10) because policy assessment in national communications was different from our analytical framework.
6-12	A	0	0	0	0	The chapter does not adequately discuss energy efficiency and mitigation options for and during construction of the buildings. These cover design, materials, construction techniques and construction process. These could also contribute	Accepted: we added the text that raised issue of minimizing embodied energy in general as well as reducing operating energy.

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						susbtantially to GHG emissions. (Government of India)	
6-13	A	0	0	0	0	Literature on conventional and traditional building design and their energy efficiency not covered. The focus in the chapter is more on modern buildings. This may indirectly imply as if buildings 100 years and older were not designed for use of natural elements to provide light, heat, air circulation and confort to the residents. These buildings are very locale specific and could provide excellent energy efficient designs even today. In many parts of the world, these buildings are still in active use, and/or those designs can still be employed in conjuction with the latest technology. The chapter could look into the possibilities of integrating old and new energy efficient designs. There are many excellent books written on old building architecture globally. May be a sub-section on this would be appropriate. (Government of India)	Accepted: this is addressed in the new section 6.4.7 on Active collection and transformation of solar energy.
6-14	A	0	0	0	0	Energy savings and benefits from small incremental measures/changes in existing buildings in developing countries (such as closing the gaps below the doors in developing country houses) are not discussed. Such low hanging fruits could provide substantial energy savings, and are easier to implement at a very small incremental cost. (Government of India)	Accepted: we listed easy to do changes like weather stripping, hole sealing and others in section 6.4.13.1 (Conventional retrofit of residential buildings). Also we pay attention to such measures in section 6.5 on Potential for GHG mitigation in buildings, examples include a range of developing countries.
6-15	A	0	0	0	0	Energy efficient buildings for the poor are not discussed adequately, which is very surprising for an international report like this. The Millennium Development Goals have poor in the centre of developmental agenda of the world and providing housing to them is a key element. This is more of a pressing need in developing countries. These buildings would not be the same as those for the rich, and would have to have a different approach towards energy efficiency. Substantial investments are planned for housing construction sectors in large developing countries like India during the next 10-15 years. Vast number of poor people have to be provided housing. This implies that substantial opportunity exists for making these buildings more energy efficient, utilizing locale specific natural elements to the extent possible (see point 3 above), and thus could be a prominent GHG mitigation option. (Government of India)	Noted: we covered it to some extent in sections 6.9.1 (Synergies with sustainable development, now 6.9.2) and in the co-benefits section, as well as Table 6.2 (now 6.6.) covers it to some extent. We also added some text in section 6.4.2 (thermal envelope) referring to savings with modest amount of insulation in countries with mild climate (including developing countries). Three references specially for developing countries were added. Unfortunately space does not limit us to go into more detail.
6-16	A	0	0	0	0	While the IPCC Special Report on F-gases does cover emissions from the building	Accepted: noted while revising the section.

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						sector, its time horizon is 2015. This time horizon is shorter than the time horizon for the buildings chapter, and this limitation should be clearly noted. U.S. Government (Government of U.S. Department of State)	
6-17	A	0	0	0	0	Halocarbons are discussed elsewhere in this report, e.g. in Chapter 7, but the mitigation of halocarbon emission from the building sector is not. This is a major omission, since these are emissions that can be relatively easily be controlled at low cost. 1.5 GtCO2-eq. is more than 10% of total GHG emission from the building sector. U.S. Government (Government of U.S. Department of State)	Accepted: we added a paragraph summarizing findings on halocarbon mitigation potential from IPCC/TEAP report into the section 6.5.1. on the Recent advances in potential estimations from around the world.
6-19	A	0	0	0	0	Chapter 6 is well written and balanced. It shows well both the size and low cost of many policies of conservation in buildings, and also that they should be implemented early. The main remark should be that these clear results (e.g. the cost-potential curves displayed on figure 6.4 at p.40) should be more prominent in the SPM or in the TS. (ANTOINE BONDUELLE, Université Lille II)	Accepted: we urged the TSU to note this comment.
6-18	A	0	9	4	9	Footnote 2 should indicate that the 2.5 GtCO2eq cited from the IPCC/TEAP report is only ozone-depleting halocarbons, halocarbons used as replacements thereto, and HFC-23 emissions from the production of HCFC-22. Other halocarbon emissions (e.g., from semiconductor, aluminum and magnesium manufacturing) are not included. U.S. Government (Government of U.S. Department of State)	Noted: however the footnote is taken out and thus this comment is no longer applicable.
6-20	A	1	0	94	0	In the Chapter the main emphasis is directed to energy savings, including the lines and technologies in order to obtain it. I personally think that we have work very hard with the conscience of persons and education, in order to obtain that each house reduces the consumption of electricity, heating, water, and others, not only for the costs(that not solve the problem), but too for the preservation of main ecosystems and human life; and a larger use of renewable energies. These aspects will need to bew reflected more clear and appropriately. (CRISTOBAL FELIX DIAZ MOREJON, MINISTRY OF SCIENCE, TECHNOLOGY AND THE ENVIRONMENT)	Noted: we agree, but we do not have space, and is slightly beyond the scope of our chapter.
6-21	A	1	0	1	0	footnote 1: replace "non-domestic" by "non-residential" (Aviel VERBRUGGEN, University of Antwerp)	Accepted: changed.
6-33	A	4	0	6	0	Include in the executive summary the training of professionals in the building sector as an important part of reducing emissions from this sector see section	Accepted: included.

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						6.8.1.3 (Kirsten Macey, Climate Action Network Europe)	
6-22	A	4	5	6	27	There is not a single mention of the need to consider embodied energy and emissions when striving for optimized life cycle performance of structures. Building codes tend to cause structures to have comparable operating energy requirements (especially for heating and cooling) regardless of the materials of construction. Therefore, the differences in embodied energy and emissions can be important even when they represent a relatively small, albeit not insignificant, fraction of the life cycle performance. This needs to be acknowledged in the Executive Summary. (Reid Miner, NCASI)	Rejected: no space for this in the executive summary.
6-23	A	4	5	6	30	Surprised to see no mention of any barriers in the whole executive summary. Difficult to understand then why those existing technologies are not being picked up. It is a key message to establish: to show that there is really a role to be played by the public sector (Philippine de T'Serclaes, International Energy Agency)	Accepted: a paragraph on barriers to penetration of efficient technologies was added.
6-24	A	4	7	4	8	Question: does this include indirect emissions caused by the electricity sector? (bernard aebischer, ethz)	Accepted: text edited.
6-25	A	4	14	0	0	suggest to replace "three major ways" by "many different ways" and add to the list : "choosing the right design and the right building materials, raising public awareness and improving the education of architects and engineers, improving the regulation". (Faouzi Senhaji, I.A.V. Hassan II (GERERE))	Taken into account by rephrasing the opening sentence.
6-26	A	4	14	4	20	The list of ways to reduce emissions associated with residential/commerical buildings should include a fourth way: i.e. the use of building materials and systems that are less carbon-intensive to produce. Alternatively, the last sentence in the paragraph could be changed to read "In addition, buildings can contribute indirectly to reducing carbon emissions in multiple ways, including by the choice of construction materials, type of building and location in reducing sprawl and thus personal transport. (Reid Miner, NCASI)	Taken into account: “embodied energy” as part of the three ways to reduce GHG emissions is added.
6-27	A	4	14	4	21	It has been mentioned repeatedly during the oral presentations: definetely agree that this paragraph needs to be rephrased, as it is currently confusing for the reader (on the "three major ways") (Philippine de T'Serclaes, International Energy Agency)	Accepted: the sentence is revised and edited.

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6-28	A	4	15	4	16	On p.5 line 10 it states the largest savings in energy use for new buildings arise through the design and operation of buildings. This should be included in line 15-16 on page 4 as part of the three major ways to cut GHG emissions. Remove the reference to controlling the emissions of non-Co2 GHG. (Kirsten Macey, Climate Action Network Europe)	Rejected: the improvement of new buildings is included among the three categories to mitigate GHG emissions in buildings. It is important to include non-CO2 GHGs.
6-29	A	4	20	4	20	Replace "including by the" with "including by the reduction of electricity demand, the" (bernard aebischer, ethz)	Rejected: energy consumption includes electricity demand, as covered in the previous sentence.
6-30	A	4	21	6	24	This sentence should mention space heating. This end use is still larger than space cooling in U.S. buildings - http://buildingsdatabook.eren.doe.gov/docs/1.3.3.pdf - and advanced technologies – such as combined heat and power – could realize large savings as well. U.S. Government (Government of U.S. Department of State)	Unfortunately we do not find which text this refers to. The given line numbers contain different text.
6-31	A	4	33	4	33	Give an estimate of the uncertainties on these figures. (Government of France)	Accepted: high confidence level was added.
6-1	B	4	33	4	35	In this section of the Executive Summary it would be helpful if the authors could also provide an estimate of the costs involved to reach the mitigation potentials provided. (Government of Australia)	Noted: we added the potential that could be reached at zero, 20 US$/tCO2, and 100 US$/tCO2.
6-32	A	4	42	0	0	Footnotes Despite that fact that halocarbons are dealt with in the special report, we think that this subject should also be dealt with in more detail in this chapter. As much information is already to be found in the special report, we think that a modest effort in this respect would make the results in the special report accessible to a much wider audience. (Government of Norwegian Pollution Control Authority)	Accepted: additional information on halocarbon sources, baseline emissions, potential for mitigation, policies to reduce halocarbon emissions, and other details were added.
6-34	A	5	0	0	0	Throughout the chapter, the term “appliances” is used without a specific definition of what is included – for example, does this include small heating and cooling equipment (window air conditioners, space heaters, etc.)? Are water heaters considered “appliances”? A clear definition (perhaps in a footnote) is needed, and consistent application throughout the chapter. U.S. Government (Government of U.S. Department of State)	Accepted: definition is added.
6-35	A	5	10	5	10	replace "appliances" with "appliances, highly efficient ventilation and cooling" (bernard aebischer, ethz)	Accepted, however, later the whole was shorted and largely rewritten and the sentence was cut at all.
6-36	A	5	24	5	27	If space heating and space cooling mechanical systems are supposed to be part of	Rejected for space reasons.

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						"energy efficient appliances" that is not clear. Recommend calling both out separately, since both areas offer significant energy savings potential. (23 SEER air conditioners will soon be commercially available, for example). Water heating should also be identified separately as this is an end-use with tremendous potential for improvement. U.S. Government (Government of U.S. Department of State)	
6-37	A	5	25	5	27	To add:¨.....controlling standby and idle power consumption, advanced lighting systems, and a larger application of bioclimatic aspects in the design and exploitation of buildings, are important in both residential and commercial sectors (CRISTOBAL FELIX DIAZ MOREJON, MINISTRY OF SCIENCE, TECHNOLOGY AND THE ENVIRONMENT)	Rejected due to space limitations.
6-38	A	5	33	5	33	replace "life." with "life. Due to the building users' willingness to pay for the latter benefits, they get economically relevant als for building owners and invstors" (bernard aebischer, ethz)	Rejected due to space limitations.
6-39	A	5	35	5	35	To add:¨.....air pollution by millions of cases annually worldwide.In the same way the majority of developing countries need to improve their dwelling infrastructure, taking into account its state of construction, provisionality, access to services, and others, if we want to reduce the GHG emissions and take care with population health, and of course, in first time the availability of financial resources. (CRISTOBAL FELIX DIAZ MOREJON, MINISTRY OF SCIENCE, TECHNOLOGY AND THE ENVIRONMENT)	Rejected due to space limitations.
6-40	A	5	49	6	1	The text on Pg. 4, lines 32-36 indicates an economic mitigation potential of 21-27%. This text indicates that up to 62% of the emission from buildings in developing countries and economies in transition and up to 25% of those in developed countries can be captured at net negative cost. This would seem to indicate an economic mitigation potential substantially higher than 27%. The two statements need to be reconciled. Table SPM.2, which is repeated as Table TS. 19 and as Table 11.3, indicates a mitigation potential of 28.3% at net negative cost, which does not agree with either of the two statements in Chapter 6's Executive Summary. (Lenny Bernstein, L. S. Bernstein & Associates, L.L.C.)	Noted: first, we double checked all the studies having very high estimates of potentials, second, we clarified that our use of the term "up to" refers to the highest credible savings in the studies we reviewed. The global economic potential of 27% (now 29% based on the latest review) came from an average rather than the highest results. Rejected: those SPM-2 and TS-19 numbers (actually TS-18) were for 2030, whereas our executive summary in SOD was for 2020, so these numbers were different. However, presently all potential figures are double

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							checked to correspond to each other in our Chapter, Chapter 11, as well as TS and SPM.
6-41	A	5	49	6	14	Keep refering to these 11 studies throughout the chapter. But by the end of the chapter, was still not quite sure which one they were. Might want to clarify that in the first footnote where they are mentioned. There is here a presentation of the cost effectiveness of EE as an evidence while its cost effectiveness in the short term has not been clearly demonstrated. (Philippine de T'Serclaes, International Energy Agency)	Noted: we did include the references for the 11 studies at the first occurrence of this issue (SOD: page 39, line 40), except for the executive summary where we did not give references. At the present state, the statement based on analysis of those 11 studies was cut.
6-42	A	5	49	6	1	The text on Pg. 4, lines 32-36 indicates an economic mitigation potential of 21-27%. This text indicates that up to 62% of the emission from buildings in developing countries and economies in transition and up to 25% of those in developed countries can be captured at net negative cost. This would seem to indicate an economic mitigation potential substantially higher than 27%. The two statements need to be reconciled. Table SPM.2, which is repeated as Table TS. 19 and as Table 11.3, indicates a mitigation potential of 28.3% at net negative cost, which does not agree with either of the two statements in Chapter 6's Executive Summary. Table SPM.2 seems to show a 21% potential at neg negative cost. Rounding "21-27%" to "about "20-30%" may be appropriate. U.S. Government (Government of U.S. Department of State)	The same as response to comment 6-40: Noted: first, we double checked all the studies having very high estimates of potentials, second, we clarified that our use of the term "up to" refers to the highest credible savings in the studies we reviewed. The global economic potential of 27% (now 29% based on the latest reviews) comes from an average rather than the highest results. Rejected: those SPM-2 and TS-19 numbers (actually TS-18) were for 2030, whereas our executive summary in SOD was for 2020, so these numbers were different. However, presently all potential figures are double checked to correspond to each other in our Chapter, Chapter 11, as well as TS and SPM.
6-2	B	5	50	6	7	The authors should explain whether the potential reductions and cost estimates include potential "rebound" from increasing energy use. (Government of Australia)	Noted: the studies do not take into account the rebound effect typically. Our chapter text indicates that this is generally a small effect.
6-3	B	5	50	5	52	It would be helpful if the authors could provide an aggregate percentage for global emissions reductions by 2020 that could be achieved at a negative cost. (Government of Australia)	Rejected: it is already included in the fourth (now fifth) paragraph of the executive summary.
6-43	A	5	52	0	0	replace "captured" by "saved" (Faouzi Senhaji, I.A.V. Hassan II (GERERE))	Accepted, however, presented the whole paragraph got cut.
6-4	B	6	28	6	28	add as a new para "The large potential for improvements in energy efficiency and conservation can be utilised by speeding up diffusion of existing technology and by	Rejected for space reasons.

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						introducing progressive improvements in standard practices. Priority should be given to existing buildings as these constitute a large potiential (in Annex I countries and rapid growing developing countries." (Government of Netherlands/Ministry for the Environment)	
6-44	A	6	31	6	33	Include reference to cutting the energy use of buildings by' building an energy efficient building'. (Kirsten Macey, Climate Action Network Europe)	Rejected: we believe our sentence incorporates the raised concept.
6-45	A	6	31	0	0	the same as above page 4, line 14. (Faouzi Senhaji, I.A.V. Hassan II (GERERE))	Accepted: the sentence is revised and edited
6-46	A	6	39	6	39	Question: is fuel switching of heating systems also covered in chaptre 4? If not one should try to include it in chaptre 6. (bernard aebischer, ethz)	Noted: due to space limitations we had to exclude the discussion of most fuel switching options.
6-47	A	6	46	6	47	Include in this sentence - Air conditioning energy use can be minisid through appropriate building design for climate and use of alternative cooling devises such as fans. (Kirsten Macey, Climate Action Network Europe)	Accepted, however, recently almost whole paragraph with this sentence was cut.
6-49	A	7	0	35	0	Again: think the whole technical part could be dealt with much more superficially and could be placed in the annex. Could keep the table 6.3 though which is useful (Philippine de T'Serclaes, International Energy Agency)	Noted: too much details were shortened and in total the technical part was reduced.
6-48	A	7	37	7	38	Carbon dioxide emission - buildings --rate of 1.8%,--- CO2 emissions for commercial grew 0.8% is more rapidly than those for residential buildings--. Is 0.8% true? It would be higher than 1.8%. (Yutaka Tonooka, Saitama University)	Accepted: the growth rates for the residential and commercial sectors were clarified.
6-50	A	8	1	0	0	Dear, I got an email Thank you so much. Now I am reading it. By the way Price,etal,2006 on the first line of page8 was not listed in the References. It would be in page 89 'P' part. (Yutaka Tonooka, Saitama Univ. Faculty of Economics)	Accepted: added.
6-51	A	8	5	9	5	The scenarios could be more commented: developing countries would not have such a big growth in emissions in scenario A1 if they would make a "technological leap" and use the best available technology. The report states that it´s a big problem with growing energy demand in developing countries but doesn´t try to give a solution to the problem.	Rejected: in this section we are just reporting the scenario forecasts. The rest of the chapter deals with solutions.

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						(Government of Finland)	
6-52	A	8	15	0	0	You could add the IEA Energy Technology Perspectives results here, by adding the sentence. "The IEA projects energy use in the buildings sector to increase by 88% between 2003 and 2050, or 1.4% per year in a Baseline Scenario. Continued economic growth leads to more commercial floor area, and the number of households continues to expand. Electricity consumption increases at 2.5% per year, raising its share in the buildings sector from 24% in 2003 to 40% in 2030, largely at the expense of renewables. This reflects the growing share of electric appliances and other electrical uses. By 2050, 59% of final electricity use is accounted for by the buildings sector. CO2 emissions (including upstream electriicty emissions) increase by 139% over the period to 2050 as the electricity sector becomes more carbon intensive due to higher energy prices. (Michael Taylor, International Energy Agency)	Noted: Chapters 4-10 are supposed to cover the period of up to 2030 only, however we added one sentence from IEA Energy Technology Perspectives to section on Recent Advances in Potential Estimations from around the World (page 39, lines 40-42 now).
6-53	A	8	15	8	15	(Price, et al.,2006) This doesn't appear in the 6.10 References. It would be in p89 l49. (Yutaka Tonooka, Saitama University)	Accepted: reference added.
6-54	A	9	0	26	0	compress the section from 6.4.1 to 6.4.12, because these contents are not key points to support the conclusion. (Government of China Meteorological Administration)	Accepted: agreed cuts were made, although some proposed additions add back material.
6-55	A	9	8	22	0	There is a general statements of passive solar design without clear definitions for what it is. This will be dependent on climate zones but large amounts of literature exist for this See also explanation on passive solar design below. Passive Solar Homes These incorporate a number of principles to ensure a naturally comfortable building all year round, by using energy from the sun or controlling the entry of the sun. The main principles include: Site orientation: living areas orientated to face true solar north (in the southern hemisphere) or south can benefit from free warmth and light in winter, whilst escape overheating in summer. Ventilation: using cross ventilation techniques and appropriate window types to capture cool breezes. Thermal (heat) storage: using building materials such as concrete and masonry to absorb heat and provide a more stable, consistent temperature within the home. Insulation: slowing down the transfer of heat into or out of the home. Shading: incorporating appropriately sized eaves and awnings to control the entry of the sun. Glazing: using a variety of glass products to allow in natural light, whilst controlling the flow of heat into or out of the home through windows. Landscaping: use a variety of plants to block strong winds, cool hot summer winds, provide	Accepted: This is all valid. Some of these points are now alluded to in the new section 6.4.1.7 (which flags building form, orientation, height, self-shading), but we do not have the space to go into more detail.

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						shade, reduce sunlight reflection of hard surfaces. Energy Efficient Homes typically include elements of passive solar design and also ensure that appliances and features throughout the house are also energy efficient. http://www.qccqld.org.au/climate_change/files/Hot%20tips%20final.pdf Hot tips for cool solutions: Practical advice for how to improve energy efficiency and reduce greenhouse pollution in your home. http://www.southface.org/web/resources&services/publications/technical_bulletins/PSD-Passivesolar%2000-790.pdf#search=%22passive%20solar%20design%22 Technology Fact Sheet; http://www.greenhouse.gov.au/yourhome/technical/fs10.htm Your Home Technical Manual (Kirsten Macey, Climate Action Network Europe)	
6-56	A	9	10	9	22	Wouldn't it be best to draw a clearer line btw the residential and commercial straight away? (Philippine de T'Serclaes, International Energy Agency)	Accepted, the commercial sector is defined in a footnote, page 1.
6-57	A	9	15	9	20	Some overarching context would be useful before getting into the details. One way to do that is to provide some sense of the end-use "splits" so the reader understands the relative shares of space cooling, space heating and lighting, for example. Illustrative national examples be provided? For example, here are the end-uses for homes and buildings in the U.S.: http://buildingsdatabook.eren.doe.gov/docs/1.1.4.pdf A quick look at this chart immediately communicates the importance of space heating relative to cooking, at least in the U.S. U.S. Government (Government of U.S. Department of State)	Accepted: we added Figure 6.3 (page 11 now) which illustrates the breakdown of residential and commercial energy use in one developed country and one developing country.
6-58	A	9	22	27	16	All technical mitigation options should be sent to the annex of this chapter, with a short summary in the text. The non technical option mentioned page 10, line 30 (change behaiour) may remain in the rearraned text, with a phrase on the importance of public awareness in this regard. (Faouzi Senhaji, I.A.V. Hassan II (GERERE))	Rejected: they are reduced, but they are important to keep.
6-59	A	9	24	9	25	Before insulation, "form" factors such as orientation and aspect ratio and the number of floors should be mentioned, at least in designs for new buildings. Correct orientation and aspect ratios can greatly reduce space conditioning loads, maximize use of natural light and can also result in the maximum use of rooftop solar systems. These form factors, because they affect multiple end-uses, deserve more emphasis." U.S. Government	Accepted: thank you for the good point. This is now covered in the new Section 6.4.1.7. "Consider building form, orientation, and related attributes".

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Government of U.S. Department of State)	
6-60	A	10	8	10	8	replace "open bodies of water" with "open bodies of water, and ambient air" (bernard aebischer, ethz)	Rejected: we want to focus on heat sources/sinks that are better than the air, the use of which is very conventional (See section 6.4.1.).
6-61	A	10	8	10	9	Ambient air also can be used as heat source and sink. (Yoshiyuki Shimoda, Osaka University)	Rejected (as answer to comment 6-60): we want to focus on heat sources/sinks that are better than the air, the use of which is very conventional (See section 6.4.1.).
6-62	A	10	8	10	9	Ambient heat also can be used as heat sources. (Shinichi Nakakuki, The Tokyo Electric Power Company)	Rejected (as answer to comment 6-60): we want to focus on heat sources/sinks that are better than the air, the use of which is very conventional (See section 6.4.1.).
6-63	A	10	10	10	11	replace "and radiative cooling to the night sky" with ",radiative cooling to the night sky, and ground or geothermal sinks*" * comment: used as geothermal heat source in winter, and as geothermal sink in summer, technically realised by borehole ducts of 100 to 150 m (bernard aebischer, ethz)	Accept, except that the phrase "earth-pipe cooling" instead of proposed was used so as to maintain a common structure to the examples.
6-64	A	10	18	10	18	Add this phrase at the end of line 18: ", but may also increase heating loads, although usually by lesser amounts and possibly for different fuel types." U.S. Government (Government of U.S. Department of State)	Accepted: added.
6-65	A	10	36	10	36	after "London." insert: "More recent research found similar relativ varations for energy-efficient houses, but the absolute impact of user behaviour is substantially lower in these building (e.g. Lenel, Gemperle et al. 2004) (bernard aebischer, ethz)	Noted: however, the reference appeared in German which we could not read.
6-66	A	11	32	11	34	replace "Reducing the envelope heat loss by" with "Reducing the envelope and air exchange heat loss by" Comment: if only a part of the losses are included in the statement, i.e. if heat loss of air exchange is neglected, it might not be true! (bernard aebischer, ethz)	Accepted: added.
6-67	A	11	34	11	34	To add:¨.....equipment, occupants, and lighting. Another is the situation of hot-climate countries, where the necessity is that walls accumulate the minimun of heat, that is, the thermal envelope would be able to fulfill this condition. (CRISTOBAL FELIX DIAZ MOREJON, MINISTRY OF SCIENCE, TECHNOLOGY AND THE ENVIRONMENT)	Accepted: this is reflected in section 6.4.2 on Thermal envelopes and in section 6.4.4. on Cooling and cooling loads.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-68	A	11	35	11	35	why "Insulation" part is not described before "Windows" ? At the first part of 6.4.2 the three key elements (□)-(□) is listed, so following part would consist of the three. (Yutaka Tonooka, Saitama University)	Accepted. This comment raises the point that we introduced three elements to thermal elements in 6.4.2, but then provided subsections for only two of them (windows and air leakage). We did discuss insulation, but not as a separate subsection, so a subsection heating for insulation was added (6.4.2.1).
6-69	A	11	36	11	36	replace "windows" with "windows and glazing" (bernard aebischer, ethz)	Rejected: we prefer windows as a simpler term.
6-70	A	11	41	11	41	Operable(openable) windows are available--- and in p12, l22 "air-flow windows" is listed up. Is "operable (openable)windows" includes "air-flow windows" or not? If including, "operable(openable)" could be replaced with any other words, for example "High performance windows (Yutaka Tonooka, Saitama University)	Noted: we have included all concepts proposed except for air flow windows, that are treated in a later section.
6-71	A	11	46	11	47	This section should mention the potential of dynamic windows, an emerging technology, to save energy. Electrochromics (for example) use voltage to switch the opacity of the glazing, allowing active management of cooling and heating and lighting loads. This is a significant research initiative of the U.S. Department of Energy: see http://www.eere.energy.gov/buildings/tech/windows/technology.html. U.S. Government (Government of U.S. Department of State)	Noted: the reference was checked, a sentence on dynamic windows was included.
6-72	A	11	47	6	47	replace "minimizing increased cooling requirements" with ""minimizing cooling requirements" (bernard aebischer, ethz)	Accepted: exchanged.
6-73	A	12	5	12	5	replace "humidity" with "humidity, and cooling load" (bernard aebischer, ethz)	Rejected: doing so would detract from the emphasis on humidity, which is a particular problem in humid climates.
6-74	A	12	23	12	23	add: ' preheating of ventilation air through buried pipes "and/or efficient heat recovery from the exhaust air" ' [CEPHEUS Hanover 2001 p.11] (Government of Germany)	Rejected: exhaust air heat recovery is not a form of passive solar heating, which is what the sentence is about.
6-75	A	12	29	12	29	About the unit of heating energy level, here kWh/m2/yr is used. How about the description policy on the energy unit? Mjoul/m2/yr could be used, however we should show thet the unit is primary energy base or second energy base and LHV (low calorific value) or HHV (high calorific value). In case in terms of total energy	Noted: we are using kWh/m2/yr, a common unit for buildings. We also use EJ, a common metric unit, for aggregate use of energy in buildings. We think this satisfies the request

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						consumption in the world EJ is use (for example p13 l35,l36). Do you unify energy consumption unit or several unit could be used case by case following the original paper? Or both unit, before and after converted to Joul, are shown with parentheses ? (Yutaka Tonooka, Saitama University)	for uniformity.
6-76	A	12	29	12	29	Passive Houses in colder climates don´t reach 15 kWh/m²/year, but 30 kWh/m²/year with todays technology. (Government of Finland)	Accepted: 15 kWh/m2/yr has been achieved in somewhat sunnier Germany and elsewhere in Central Europe, we added clarification on this to the text.
6-77	A	12	31	12	31	"Through integrated design process for new buildings the additional costs range about only 10% of the total, tending to decrease with further development." [http://www.ceu.hu/financial.html. , p. 82] (Government of Germany)	Accepted, however, we decided to include fresher reference - (Harvey, 2006).
6-78	A	12	36	12	36	IEA,2004d) IEA,2004b,2004d are appeared before IEA,2004a. 6.10 Reference would be re-sorted again and added missing sources. (Yutaka Tonooka, Saitama University)	Accepted: resorted.
6-79	A	12	40	13	30	In chapter 6.4.3.2 nothing is said about the fuel used in heating systems in industrialised countries. Although mainly gaseous and liquid fuels are used, at least in Germany the use of wood fired boilers is rising (on one hand due to the rise of gas- and oil prices, on the other hand due to the developement of automatically fed boilers providing almost the same ease of use as gas- or oil-fired boilers). Currently about 10 % of the primary energy used in german households is provided by wood. Modern automatically fed wood (pellet) boilers reach relatively high efficiencies at emissions largely inferior to those of older boilers. Anyway especially emissions of particulate matter (PM10, PM2,5) stay much higher than when using other fuels. As the use of biomass for heating can contribute to climate protection targets the drawbacks concerning emission problems have to be adressed. The developement of low-emissionen techniques should be enhanced. (Government of Germany)	Accepted: This is all true but the whole point here was to emphasize the very high efficiencies that are now possible in standard heating equipment as well. However, we have not contrasted this with the 60-70% efficiency of older equipment. We added the comparison of elder and new equipment efficiencies to clarify the whole point of that paragraph."
6-80	A	12	45	12	52	According to technical data sheets compiled by producers gas-fired condensing boilers can reach annual fuel utilizations efficiencies up to 109% based on the lower heating value and according to the german Standard DIN 4702 Part 8. Anyhow, the cited efficiency should be related to a national or international standard as such values can vary largely depending on the definition used (e.g.	Noted: if we specify that are efficiencies are based on the HHV, we have to define what HHV is – adding more technical detail, which we have been asked to avoid.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						based on upper or lower heating value, test programm used to determine the annual fuel utilization). (Government of Germany)	
6-81	A	13	9	13	9	The low temperature level of floor or wall radiant heating makes it possible to use low-level solar energy with a higher fraction of space heating energy. (Government of Germany)	Accepted: a sentence reflected this point is added (now page 17, lines 9-10).
6-82	A	13	10	13	26	This paragraph should better distinguish between the various options, which include either the extraction of heat from dep aquifers as well as the geothermal production from shallow sources (soils, rocks, groudwater) with heat pumps, in order to cover needs for heat at low temperature (building heating and cooling, production of sanitary hot water). The first type developped during the oil shock in the year 70' in areas where district heating systems could be developped (namely in the Paris suburbs). The second type now develop rapidly in Europe, and the potential for growth is huge. f.i., the yearly increase in France could be equal to the presently installed capacity on conventional district heating systems exploiting deep aquifers (i.e. 150.000 housing/year, i.e. half the constructions of new houses).Geothermal heating from shallow resources (vertical or horizontal heat exchangers in soils; wells producing from local aquifers…) offer interesting solutions for housing heating with heat pumps. Already 70% of new housing are heated with that process in Sweeden, and ratios of 50% are reached in Germany and Switzerland. There is a huge potential for growth of such systems in Europe (e.g. 50% of the market of new houses i.e. 150.000 housing/year in France). Schemes can be made available to illustrate theses technologies (cf. brochure "La géothermie" BRGM - ADEME, 2005) (VARET jacques, French Geological Survey)	Rejected due to space limitations.
6-83	A	13	10	13	26	The ecological efficiency of heat pumps depends dramatically on the way of electricity generation: if electricity is produced CO2-intensively (as it usually is), there must be a closer look at the real CO2-emissions including the annual mean COP which is different from the COP described above. A heat pump with an annual mean COP of 4 can compensate the primary energy used for electricity generation but is just slightly more efficient than a fossile fuelled furnace. With 33% efficiency of electricity generation a heat pump must have an annual mean COP much higher than 4 for significantly reduce CO2-emissions. (Government of Germany)	Accepted: the following has been added: "Due to the large energy losses (typically 60-65%) in generating electricity from fossil fuels, heat pumps are particularly advantageous for heating when they replace electric-resistance heating, but may not be preferable to direct use of fuels for heating."
6-84	A	13	11	13	12	replace "or ground" with ", ground or ground water"	Rejected because we consider groundwater as

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(bernard aebischer, ethz)	a part of the ground.
6-85	A	13	17	13	17	Distribution temperature should be 25-35 degrees, not 30-35 degrees. (Government of Finland)	No longer applicable (sentence deleted).
6-86	A	13	18	13	22	COP of heat pump should be checked, 7,0 is too high. It should also be said if it´s a yearly COP or the best "peak COP". Yearly COP should be used and isn't more than max 4,0, especially in colder climates. The climate effect on COP should also be mentioned. (Government of Finland)	No longer applicable (sentence deleted).
6-87	A	13	23	13	26	This comparison is inappropriate. Electricity is usually generated not only by fossil fuel but also by hydro, nuclear, and so on. Therefore, in this report assessing options which mitigate global warming, the nature of fuel-mixed-electricity should be considered. In addition, it should be noted that efficiency of gas-fired power generation almost always exceeds 40%, much higher than 33%. <Reference> "Updated Comarison of Power Efficiency on Grid Level" ECOFYS Aug 2005 (Shinichi Nakakuki, The Tokyo Electric Power Company)	No longer applicable (sentence deleted).
6-88	A	13	26	13	26	Add "Also absorption heat pumps without a mechanical engine are emerging into the market place" see e.g. http://www.heatpumpcentre.org/About_heat_pumps/HP_technology.asp (bernard aebischer, ethz)	No longer applicable (sentence deleted).
6-89	A	13	30	0	0	I would include a section on cooking, rather than talk about stoves under Space heating Systems, given their importance in developing countries and the associated health and economic benefits of shifting to more efficient biomass stoves, or modern energy carriers. (Michael Taylor, International Energy Agency)	Accepted: we provide now a separate paragraph on cooking stoves in section 6.4.11 on “Household appliances, consumer electronics, and office equipment” and move the discussion there.
6-90	A	14	1	14	9	fig6.3 Unclear and difficult to understand. This would be explained more.In the Figure title, non-methane hydrocarbons, and nitrous oxide are couls be written as NMHC, N2O. (Yutaka Tonooka, Saitama University)	Figure was deleted.
6-5	B	14	1	0	0	Fig 6.3: Misleading. Caption should be: "GHG emission from Indian households". Make clear that with modern wood stoves this is not representative! This should also appear in the text body. (Government of Germany)	Figure was deleted.
6-91	A	14	14	14	17	The total green house effect evaluation including CH4,N2O,BC,OC, not only fuel	Noted: we double checked the claim of 3-10

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						CO2 or biomass CO2 is very important in rural energy consumption in developing countries.I am studying about China . See for example Streets et al (2003) , Penner et al (2003) Streets D,et al(2003)An Inventory of Gaseous and Primary Aerosol Emissions in Asia in the year 2000, J. Geophys. Res., 108(D21),8809,doi:10.1029/2002JD003093,2003 Penner J.E,Zhang, S.Y.,Chuang,C.C.(2003)Soot and Smoke Aerosol May not Warm Climate,J. Geophys. Res., 108(D21),4657,doi:10.1029/2003 JD003409 (Yutaka Tonooka, Saitama University)	times higher non-CO2 GHG heating effects. We deleted supporting figure 6.3. and put the reference to the factor 3-10 to the text. We added a sentence on black carbon causing heating in addition to GHGs.
6-6	B	14	14	0	0	When and under which circumstances do these PIC (which?) occur? (Government of Germany)	Noted: literature indicates that this is a ubiquitous problem with biomass combustion in developing countries.
6-92	A	15	18	15	18	replace "in most climate, they include:" with " in most climate, they include: (i) reducing internal heat loads from appliances and lightings (by efficient equipment and control)". (bernard aebischer, ethz)	Accepted: except that the choice of appliances is not a design feature (which is what the list about), this point was added in a separate sentence at the end of the paragraph.
6-93	A	15	19	15	19	Comment: I would name the building orientation as last point and maybe differentiate regarding latitude. Actually, in more northern latidues (typically north of the alps) the most critical orientation regarding cooling load is south (since it is exposed almost 12 hours a day and the angle of radiation is low enough so that solar radiation penetrates into the building" (bernard aebischer, ethz)	Rejected: the list of items is prefaced with "in most climates". We don't have space to list exceptions – we just want to give a general impression that there are many simple things that can be done.
6-94	A	15	26	15	33	Increasing the solar reflectivity of roofs --- saving cooling energy of 50-60%-- Is this true? So drastic reduction possible or not? (Yutaka Tonooka, Saitama University)	Rejected: the text indicates that the 50-60% savings is the result of several measures at once, not just reflective roofs; we added "road albedo" to the list.
6-95	A	15	31	15	33	This paragraph should make it clear that potential savings from cooling energy need to also include any increase in heating energy requirements from a cool roof, and that the effects vary both by climate zone and building type. Also, the reference to residential cooling savings should be clear about whether this includes both a microclimate effect and direct reductions in heat gain through the roof. Toronto may not be the best example for this, given how much construction and added air conditioning is occurring in warm climates. U.S. Government (Government of U.S. Department of State)	Taken into account: the Toronto example sentence is deleted.
6-96	A	15	39	15	40	replace "and Levermore (2000)" with ", (2000), and Wellig et al. (2006)"	The paper was in German that made

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(bernard aebischer, ethz)	impossible to read and consider the paper.
6-97	A	16	6	16	7	Include windows as part of the basket of design features for natural ventilation. (Kirsten Macey, Climate Action Network Europe)	Accept: added “operable windows”.
6-98	A	16	22	16	22	--of 5 to 7 K Is this □? (Yutaka Tonooka, Saitama University)	Accepted: corrected.
6-99	A	16	24	16	24	eventually replace "air conditioning" with "cooling" (because one still might need ventilation to ensure indoor air quality) (bernard aebischer, ethz)	Accepted: replaced.
6-100	A	16	28	16	28	replace "California" with "California. Similar results were found for Switzerland by Jakob et al. (2006)" (bernard aebischer, ethz)	Rejected: we have no more room for additional examples.
6-101	A	16	35	16	50	Section Evaporative Cooling: add "For aride regions the high consumption of water as limited ressource should be balanced with savings in electricity consumption, esp. concerning future periods of water shortage." (Government of Germany)	Noted: the phrase “Subject to availability of water” has been added when mentioning evaporative cooling in arid regions. We don’t have space to add more (there is only a partial offset of on-site water use by savings at the power plant).
6-102	A	16	38	16	38	replace "indirect evaporitve cooler," with "indirect evaporitve cooler (also refered to as adiabatic cooling)," (bernard aebischer, ethz)	Rejected: the term is too technical.
6-103	A	16	43	16	49	This drastic saving potential would be depend on the cold water gaining system. It is better the source of the cold water is shown. (Yutaka Tonooka, Saitama University)	Rejected: the discussion is not about using ambient cold water for cooling.
6-104	A	17	10	17	10	An other passive cooling technique consists in using ground or geothermal layers as sinks. This is particularly energy and cost-efficient if the same source is used as heat source for heat pumps in winter. Several cases in Switzerland showed that during most of the time the only meachnical energy needed is the one for pumping the water cooled by the ground and that mechanical cooling engines are only needed during some short peak periods. Technically this combined heating and cooling system is easily realised by borehole ducts of 100 to 150 m combined with heat pumps (heat pumps using geothermal energy have a market share in the Swiss single family house sector of 20% to 30% in new houses and heat pumps are becoming more and more common in commercial buildings). (bernard aebischer, ethz)	Rejected due to space limitations and because we already briefly referred to ground source heat pumps and underground earth-pipe cooling.
6-105	A	17	20	17	32	Refrigerative airconditioners are suitable for tropical humid areas, for hot, dry (less	Noted: we already discussed evaporative

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						humid) areas the more energy-efficient evaporative airconditioners are recommended. seehttp://www.qccqld.org.au/climate_change/files/Hot%20tips%20final.pdf (Kirsten Macey, Climate Action Network Europe)	cooling.
6-106	A	17	21	17	21	replace "a COP ranging" with "a nominal COP ranging" (bernard aebischer, ethz)	Accepted: replaced.
6-107	A	17	22	17	22	replace "depending on operating conditions." with depending on operating conditions. Effectively the COP of non-split devices is often as low as 1.4 to 2 due to their waste heat that is dissipated into the room." (bernard aebischer, ethz)	Rejected: this is only one of many reasons for the true COP being less than the nominal COP, but we do not have space for a balanced discussion
6-108	A	17	24	17	27	For the fluctuating nature of building heat load, not only the efficiency at maximum capacity but also part-load efficiency is important. For centrifugal chillers, variable speed compressor on sale in recent year improves the part-load efficiency and then seasonal efficiency very much. A variable speed drive centrifugal chiller achieve COP of 18 in some part-load conditions. Reference: Seki W., K. Ueda, Y. Shirakata, K. Nishii, Y. Hasegawa, T. Komuro and Y. Iritahi, 2005: Development of a high-performance turbo chiller, 8th IEA Heat Pump Conference 2005 (Yoshiyuki Shimoda, Osaka University)	Noted: a general reference to "higher COP under part-load operation" has been added, but more detail cannot be accommodated to support the new summary point that big savings are possible by selecting the most efficient equipment.
6-109	A	17	27	17	29	Considering the part-load operation of chiller due to the intermittent use of cooling in residential buildings, heat loss and energy for distribution, centralized chiller for air conditioning is not more energy efficient than split-unit air conditioner.It is necessary to show the basis. (Yoshiyuki Shimoda, Osaka University)	Accepted: the summary conclusion was reworded.
6-110	A	17	35	19	35	Mechanical ventilation with heat recovery should be included. Both for residential and commercial buildings, there is a huge energy saving potential. This is already commonly used technology in Finland. (Government of Finland)	Accepted: this is included in the now greatly-shortened section on principles of energy-efficient HVAC design.
6-111	A	17	41	17	0	Section 6.4.5.1 comment. The correct sizing of both heating and cooling systems should be mentioned here as a key principle. See for example http://www.aceee.org/consumerguide.topcac.htm and the use of Manual J calculations. Oversized air conditioners waste energy. U.S. Government (Government of U.S. Department of State)	Accepted: added in text.
6-112	A	18	10	0	0	why few lines are underlined (NOIM UDDIN, Macquarie University, Sydney)	Accepted: corrected.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-113	A	18	24	18	24	replace "1999)." with "1999). Further improvements can be achieved through local waste air extraction (Baldini and Leibundgut, 2005)." (bernard aebischer, ethz)	Accepted the point: text on heat recovery was added, however, the whole section was largely shortened and there is no room for more references and text.
6-114	A	18	24	18	24	The quoted paper Brandemuehl and Braun is in 1999. Is there more recent material? (Yutaka Tonooka, Saitama University)	Noted: we made an effort to locate fresher material, however, however, Brandemuehl and Braun (1999) is the freshest we found now to support this point.
6-115	A	18	37	18	37	Consider to replace "Computer simulations by Jaboyedoff indicate that increasing the thermostat from 24 C to 28 C will reduce annual cooling energy use by more than a factor of three for a typical office building in Zurich" with "Computer simulations by Jaboyedoff and Jakob et al. 2006 indicate that increasing the thermostat by 2 C to 4 C will reduce annual cooling energy use by more than a factor of three for a typical office building in Zurich" (bernard aebischer, ethz)	Accepted: the references were checked, the sentence was incorporated.
6-116	A	18	37	18	37	Comment: A set point temperature of 28 C is actually to high as compared to Swiss and European Comfort requirements where 26 is an upper limit in mechanically ventilated buildings (compare also to p. 15, line 48 to 50). Also, set point temperatures are often below 24 C in reality. In Jakob et al. 2006 we found similar results as Jaboyedoff et al., 2004 when changing set point temperature from 23 C to 25 C. (bernard aebischer, ethz)	Accepted, however, later not included because of too much details and for space reasons.
6-117	A	19	19	19	34	Here advantage of a low speed cooling air supply system with higher temperature air of 18 □ is described. In one hand there is an other system a low temperature cold air and low volume air supply which is said energy conservative. If DV is shown here, this low volume and cold air supply system would be shown here as well. (Yutaka Tonooka, Saitama University)	Rejected: it is better to use as warm a distribution temperature as possible for cooling.
6-118	A	19	41	19	43	"Is the sentences The BEMS--- are used." This part would be re-checked.As management systems savings---are used. (l42) I could not understand why this sentence is necessary. (Yutaka Tonooka, Saitama University)	Accepted: deleted.
6-119	A	20	17	20	17	performance(15-20% is a typical result) .The source of this part is not shown here, however perhaps from Milles, et al(2004).And again it is written that retro-	Accepted: this paragraph was redundant and was deleted.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						commissioning produced median energy saving of 15%---. If so the upper sentence "Retro-commissioning ---(15-20% is ----) ---quality)." is not necessary. (Yutaka Tonooka, Saitama University)	
6-120	A	20	18	20	18	(15-20% is a typical result) This part is explained again at l26 --- saving of 15% with a ---- . So the part l17,l18 could be cut. (Yutaka Tonooka, Saitama University)	Accepted: deleted.
6-121	A	20	38	22	26	Designing energy system is an important part of city planning and design. Once the city is designed and built and energy system is fixed, it is rather a difficult task to reduce energy consumption without compromising comfort. The idea of Cogeneration and District Heating/Cooling is stipulated in Japan's "Kyoto protocol Target Achievement Plan" as CO2-saving Urban Design, Promotion of the Area Energy Network. (http://www.kantei.go.jp/foreign/policy/kyoto/050428plan_e.pdf page29) The concept of district energy is considered an effective measure to reduce ever increasing energy in a residential and commercial sector. (Satoshi Yoshida, The Japan Gas Association)	Noted (this is why we have section on district energy).
6-122	A	20	38	22	0	Section 6.4.7. Section addresses district heating. District heating is mentioned in Chapter 10(waste) an an application for waste-to-energy (incineration) systems. If possible given space limitations, please mention this source...or add reference to Chapter 10. (Jean Bogner, Landfills +, Inc)	Accepted: waste heat from incineration has been added to the list of heat sources, but no reference to 10.4.3 is added because 10.4.3 says little more.
6-123	A	20	51	21	6	Comment to No. 5: It is critical to use 'low-grade' heat and coldth storage to store high-grade electrical energy since reconversion of heat or coldth into electricity is difficult or even impossible. (Government of Germany)	Noted (this is why we list it).
6-7	B	21	15	21	15	Replace "former communist countries" with "EIT" for consistency throughout the chapter. (Government of Australia)	Accepted: replaced by "Eastern European countries and Russia".
6-8	B	21	27	0	0	Add: It can be done at the scale of individual buildings using reciprocating or Stirling engines and (in the future) fuel cells (Pehnt et al. 2006) or at the scale of district heating systems using either a simple gas turbine, reciprocating engines, combined gas and steam turbines and, in future, fuel cells. M. Pehnt, L. Schneider et al. (2006), „Micro Cogeneration – Towards Decentralized Energy Systems", Springer, Berlin Heidelberg New York Tokyo 2006. (Government of Germany)	Taken into account: included in brief version, however, was cut later for space reasons.
6-124	A	21	38	21	49	District heating using Geothermal resources also developped in France (150.000	Noted: unfortunately we can't list all instances

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						housing in the Paris region heated from a deep aquifer with "doublets" since the years 70-80) and in Iceland (98% of the demand for heat and hot water). (VARET jacques, French Geological Survey)	due to space limitations
6-125	A	21	51	21	52	The word "trigeneration" need further explanation. For example, I propose to add the following sentence; In the temperate humid and tropical climate, the need for heating is limited to a few winter months. There are, however, significant needs for cooling during the hot summer season. In this case, heat from generator is used to produce cold water for cooling via absorption chiller. This type of cogeneration system that produce electricity, hot water and cold water is sometimes called as trigeneration. (Yoshiyuki Shimoda, Osaka University)	Accepted: brief definition added in brackets.
6-126	A	22	5	22	17	In terms of district heating totally 75 line are used(too long). However could this system reduce so much emission or not? This part, in my idea would focus two points ; (1) big potential to improve in the DH system in transition country, for example Russia and China. (written in 21p l20 to l24), (2) potential of heat recovery from waste heat or natural heat sources. From incineration or many kinds of industrial process or river water or sanitary pipe line, or solar system(l15) and so on, in some cases using high performance heap pump systems, the energy saving could be realized. Showing best practice cases of heat recovery, the emission reduction potential should be described. (Yutaka Tonooka, Saitama University)	Accepted, lines 45-49 were cut.
6-127	A	22	30	22	41	It could be pointed out that if a building is an energy efficient one there is less need for solar energy reducing the costs significantly for householders. (Kirsten Macey, Climate Action Network Europe)	Noted: no space available.
6-128	A	22	39	22	41	However, if the goal is to serve most or all of the building's reduced power loads with on-site PV systems, then competition for available roof space can occur between PV and solar water heating systems, because the building requires maximum PV. PV and solar water heating are not necessarily "complementary" systems; they may actively compete. U.S. Government (Government of U.S. Department of State)	Noted; it is a good point, but unfortunately we do not have the space to go into this detail. We say "PV panels can be supplemented", leaving open what the objectives are. As well, integrated PV/thermal collectors are an option.
6-129	A	22	45	22	45	General system of PVC is described in Chapter 4. However in Chapter 4 description on PVC is too short. Fundamentals of PVC would be explained more in Chapter 4. (Yutaka Tonooka, Saitama University)	This discussion of PVC belongs in our chapter, we have discussed it as much as we can subject to space limitations.
6-130	A	23	5	23	10	There are many good practice buildings of PVC integrated. Tsukuba, Sanyo	Noted: we do not single out any given

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Yutaka Tonooka, Saitama University)	country.
6-131	A	23	34	23	34	Use of terminology low-flow suggests a reduction in water pressure - consider using water-saving to describe these shower heads. (Kirsten Macey, Climate Action Network Europe)	Accepted: clarified.
6-132	A	23	43	23	44	Heat pump water heater is an attractive alternative also to gas and oil water heaters. COP of heat pump water heater now reaches 4.9. <Reference> "Heat Pumps the Trump Card in Fight against Global Warming -The Japan Journal, Oct 06-" P22-24 Takashi YATABE (Shinichi Nakakuki, The Tokyo Electric Power Company)	Noted: we formed the range from the previous figure and proposed 4.9, however the different references, which are easier for readers to access, are added.
6-133	A	24	5	24	8	daylight use and occupancy sensors are written in (□). However occupancy sensors could be used without daylight systems. So could you make a independent new part on the occupancy sensors as 6.4.12 ? (Yutaka Tonooka, Saitama University)	Rejected: unfortunately we cannot do this due to space limitations.
6-134	A	24	10	24	30	T5,T8,T12 Some one could not understand T5 etc. Short explanation would be necessary. (Yutaka Tonooka, Saitama University)	Accepted – good point, but no longer applicable – terms deleted.
6-135	A	24	12	24	12	Replace "Continuous" with "Lighting is a major contributer to electricity demand worldwide and is expected to grow unless the existing efficieny potentials are employed (IEA 2006b). Indeed, countinuous" (bernard aebischer, ethz)	Noted: we added a sentence on the importance of lighting worldwide based on the new IEA book on lighting (Light's Labour's Lost).
6-136	A	24	22	24	30	A problem in most office buildings is the use of one light switch for a whole floor, include for another strategy to install multiple switches if a room has more than four lights on one switch and make sure each switch is clearly labeled. (Kirsten Macey, Climate Action Network Europe)	Accepted.
6-137	A	24	26	24	26	replace ", 2002)." with ", 2002). Most of these mentionned technical measures are cost-effective or can be implemented at very low additional life-cycle costs (Jakob et al., 2006). (bernard aebischer, ethz)	Noted: we think that the point of the comment is captured now by the first paragraph.
6-138	A	24	32	24	32	replace "kerosene)," with "kerosene), (IEA 2006b) (bernard aebischer, ethz)	Accepted, however, a difference source is added (as we think it supports the estimate better).
6-139	A	24	38	24	39	This last sentence should distinguish between potential LED lighting applications to general illumination, usually grid-connected, and stand-alone (off-grid) applications, often to task lighting in rural areas of developing countries – whether or not PV is the source of off-grid power. U.S. Government	Accepted: we say that it is stand-alone applications.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Government of U.S. Department of State)	
6-140	A	25	16	25	16	replace "2003)" with "2003, Jakob et al., 2006)" (bernard aebischer, ethz)	Noted: we better use this reference in another section (6.4.5.1. Principles of efficient HVAC design).
6-141	A	26	13	26	14	For the United States, the statement that "miscellaneous equipment" is 70% of all residential electricity use is factually incorrect. The source of the problem is a mislabeled Figure in the IEA report – the 70% number should refer to a fraction of RESIDENTIAL APPLIANCE electricity only, not total residential electricity (as the IEA text makes clear). For the U.S., per http://buildingsdatabook.eere.energy.gov/docs/1.2.3.pdf, home electronics and kitchen uses (including refrigeration) and office equipment constituted 32% of total residential electricity use in 2003. Most residential electricity is used for space conditioning, lighting, and water heating, not "miscellaneous uses. U.S. Government (Government of U.S. Department of State)	Accepted: we inserted the word "appliances".
6-142	A	26	19	26	23	comment: In Switzerland and probably in most European countries, appliances are not a larger fraction of primary energy use in commercial than in residential buildings. In Switzerland, appliances (in a broade sense, but excluding lighting and HVAC-equipment) represent about 30% of primary energy in all commercial buildings, 26% in all office buildings, 32% in high tech office buildings, but 38% in residential buildings. (source: Aebischer and Catenazzi, 2006; other sources exist, but I have to look for). The 50% you mention for misc. and lighting is much too high for Europe; the fraction of misc. and lighting in total primary energy lies between 10% and 30% in Switzerland. (source: Aebischer and Catenazzi, 2006; other sources exist, but I have to look for). (bernard aebischer, ethz)	Accepted: the statement corrected as" on a primary energy basis, appliances are undoubtedly a larger portion of total energy use for residential than for commercial buildings.
6-143	A	26	20	26	21	Could you add for example what appliances are top three in the 75% of total energy consumption in the US? (Yutaka Tonooka, Saitama University)	Noted: partially explained in the following sentence, however, no space to stop in details on each country.
6-144	A	26	20	26	21	The sentence beginning line 20 should read: "Appliances account for almost 40% of electricity and about 30% of total source energy consumption in US commercial buildings. (Reference is http://buildingsdatabook.eere.energy.gov/docs/1.3.3.pdf) U.S. Government (Government of U.S. Department of State)	Accepted: we double checked and corrected this number to 55% according to the EIA Annual Energy Outlook.
6-145	A	26	21	26	24	"What does "miscellaneous refer to? Lighting is about 25% of total commercial	Noted: explained in the first paragraph of the

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						energy use, per http://buildingsdatabook.eere.energy.gov/docs/1.3.3.pdf. Electronics, computers, and cooking and "other" add another 20%. Is that what miscellaneous means? Need to be clearer." U.S. Government (Government of U.S. Department of State)	section.
6-146	A	26	25	26	26	The reference to "factors of 2 to 5" needs to be more carefully nuanced to reflect the range of circumstances, from countries and appliance categories where appliance standards have removed the lowest efficiency models from the market, to countries or appliance types where there are no standards, and at the limit, countries that may be ready markets for the least efficient models that cannot be sold elsewhere. U.S. Government (Government of U.S. Department of State)	Noted: our statement does not contradict anything said here, but we do not have the space nor the documented references to provide more detailed information.
6-147	A	26	25	26	0	The comparison of H-axis clothes washers to "current standard" appears to be out of date. The 2004 standard for clothes washers (1.04 MEF) and the impending 2007 standard (1.26 MEF), significantly reduce the amount of energy of vertical axis machines and do not use 5-times the amount of energy as the best H-axis machines (2.8 MEF). In the US, refrigerators consuming less than 400 kWh per year can be purchased today and are therefore not "prototypes." U.S. Government (Government of U.S. Department of State)	Accepted: "prototype" was deleted.
6-148	A	26	35	26	37	Sentence is abstract because it is not clear how much energy is used by a refrigerator/freezer meeting latest US standards. Standby power is responsible for 5 – 10% of total electricity use in most homes and an unknown amount in commercial buildings and factories. http://www.iea.org/Textbase/subjectqueries/standby.asp (Kirsten Macey, Climate Action Network Europe)	Accepted: clarification on how much energy was used by a refrigerator/freezer meeting the latest US standards was added.
6-9	B	26	44	26	44	Korea has also been a key member of this program and should be listed as such, (i.e insert "Korea" before "Australia"). (Government of Australia)	Accepted: double checked and added.
6-149	A	27	12	27	12	"Otions"? would be "Options" (Yutaka Tonooka, Saitama University)	Accepted: corrected.
6-150	A	27	14	27	14	3) access to electricity and --- low cost appliances. This would result inducing energy demand as a rebound effect#. So could we say simply it would reduce energy consumption? #: "Rebound effect" is described in the 6.7.7 p50 l32. (Yutaka Tonooka, Saitama University)	Noted: we had no references and we doubted that there would be any significant rebound effect for cooking.
6-151	A	27	16	27	16	The source is not written. (Yutaka Tonooka, Saitama University)	Accepted: no source is needed for what we do say. However, we provided also quantitative

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
							potential for energy savings associated with improved cooking and provide references.
6-152	A	27	18	27	41	No source is written and something sound general matter. Showing best practice cases quoting the papers and to emphasize the effect is better. (Yutaka Tonooka, Saitama University)	Noted. 1. First paragraph does not need references. 2. Second paragraph was deleted. 3. Specific quantitative examples with references are in the subsequent subsections.
6-153	A	27	35	27	35	replace "worthwile" with "worthwile, in particular if the willingness to pay for comfort improvement is included into consideration (Banfi et al. 2006) (bernard aebischer, ethz)	Accepted but no longer applicable, paragraph deleted.
6-154	A	27	35	27	37	Because the mechanical system and envelope integrity "compete" for energy savings, upgrading the envelope and reducing the space conditioning loads actually degrades the economics of a more efficient heating system. A really tight envelope may reduce heating loads so much that the economics of , say, a condensing gas furnace are non existent. The second problem with this sentence is simple cash flow. After a household has spent $15,000 to $20,000 to replace windows, for example, the likelihood of further expenditures – another $3,000 for a new furnace, for example – is diminished. Bottom line: there's no particular reason why an upgraded envelope is "the" optimal time for upgrading the HVAC system. That "switch" and the downsizing could occur 5 years after the thermal envelope improvement. U.S. Government (Government of U.S. Department of State)	Accepted but the whole paragraph was deleted in order to save space.
6-155	A	28	7	28	8	Additional context or caveats are needed to put this number (combined 80-90% savings) in context, and to clarify that this is a percentage of SPACE HEAT energy, most likely beginning with a poorly constructed building. U.S. Government (Government of U.S. Department of State)	Noted: the original paper was checked and this is what is says. The contents of this sentence is "space heating" so we do not think we have to add the words "space heating" again.
6-156	A	28	17	28	21	How about CO2 emission reduction in this case? (Yutaka Tonooka, Saitama University)	Noted: answer is not given in the cited papers, and it would depend on the specific sources of electricity for this case.
6-157	A	28	19	28	19	replace 'low flow' with 'water saving' to ensure no confusion with low-pressure shower heads. (Kirsten Macey, Climate Action Network Europe)	Accepted: exchanged.
6-158	A	28	23	28	33	Again my question is how about CO2 emission reduction in this case? (Yutaka Tonooka, Saitama University)	Noted: answer is not given in the cited papers, and it would depend on the specific sources of electricity for this case.
6-159	A	28	33	28	33	Marginal costs of conserved energy of building envelope insulation are below	Noted: the references are checked,

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						marginal costs of heat generation to a large extent, in particular if insulation is applied when envelope renovations are being made anyway due to other reasons, and if energy prices are about on the 2005 level, as an extend case study regarding the Swiss residential sector showed (Jakob et al. 2002, Jakob, 2006) . (bernard aebischer, ethz)	unfortunately no space to include more details.
6-160	A	28	33	28	33	Source is not written. (Yutaka Tonooka, Saitama University)	Accepted: we added the source (Humm, 2000).
6-161	A	28	35	29	16	6.4.13.2 Only energy saving percentages are shown, however the unit energy consumption level is different by region and cases. Could you rewrite showing best practice examples with unit energy consumption level and key point of reduction, with variety of regions? (Yutaka Tonooka, Saitama University)	Rejected due to space limitations and absence of enough case studies to differentiate by region. However, we would gladly add more case study examples if we knew of any.
6-162	A	28	37	28	38	50-75% whole building savings in existing commercial buildings, where you cannot easily change orientation, or glazing fractions, or window types? Sounds optimistic. A more typical number for cost effective retrofits is 15-30%. DOE's experience is that 50-75% whole building savings require some work in new construction, where it is considerably easier than in retrofits. See for example Table 2-1 of the recent NREL report http://www.nrel.gov/docs/fy06osti/37542.pdf Note that some of these buildings are not in the 50-75% range and these were all designed to be very high performance buildings. Getting to 50%, let alone over it, is far from easy. The examples given in the rest of this paragraph do not justify the high end of this 50-75% range. U.S. Government (Government of U.S. Department of State)	Rejected because the subsequent text gives lots of references to examples where roughly 50-75% savings were in fact achieved. We do not imply that it is easy, but instead refer to "aggressive implementation of integrated sets of measures" and make a point of highlighting Rosenfeld's conclusion that it is very hard to find design teams competent enough to achieve savings of this magnitude.
6-163	A	28	40	28	40	replace "benefits." with "benefits (see e.g. Jakob et al. 2006)." (bernard aebischer, ethz)	Accepted, however, we incline to use this reference to support another section (6.4.5.1. Principles of efficient HVAC design).
6-164	A	29	18	29	18	Lippke, et al., 2004 not listed in the reference in p87 (Yutaka Tonooka, Saitama University)	Accepted: added.
6-165	A	29	21	29	25	Source is not shown. (Yutaka Tonooka, Saitama University)	Noted: the text is summarizing the material given above, however we also add an additional reference.
6-166	A	29	34	30	15	Table6.1 Is not there more new cases? Or is there any cases in any other regions? (Yutaka Tonooka, Saitama University)	Not applicable any more as the table has been deleted.
6-10	B	29	34	30	5	Table 6.1: All of the examples provided are in northern European countries. The authors should provide an explanation of this (e.g. whether the IEA Programme	Not applicable any more as the table has been deleted.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						was only for northern European countries) and should provide an assessment as to whether the results are transferable to non-European conditions. (Government of Australia)	
6-11	B	30	8	30	25	The authors should provide some further discussion of the limited impact of embodied energy on lifecycle emissions when compared to possible inefficiencies in operating energy. (Government of Australia)	Rejected due to space limitations and because we already make this point.
6-167	A	30	10	30	25	While this section acknowledges that embodied energy and emissions are a consideration, it dismisses the importance of embodied energy and emissions. The text acknowledges that "a truly holistic approach is needed in analysing the lifecycle energy use of buildings," but the rest of the text essentially states that embodied energy and emissions can be ignored. Modern building codes have the effect of requiring structures to have similar operating energy requirements (especially for heating and cooling) regardless of the materials used in construction. As a result, even though operating energy over a lifetime is greater than the embodied energy, the differences in embodied energy can be important to the total energy and emissions associated with a structure. In summary, this section needs to be rewritten so that the reader is not invited to dismiss the importance of embodied energy and emissions. What is important is that the structure is desinged to minimize, to the degree practical, total lifetime energy and emissions - including both operating and embodied aspects. (Reid Miner, NCASI)	Noted. Saying that reducing embodied energy use is less important than reducing operating energy use does not imply that the former should not be done. Additions made to this section for other reasons shift attention back to embodied energy and so already at least partly address this comment.
6-168	A	30	10	30	25	Could you show percentage of CO2 emission from embodied energy as LCCO2? I wrote a paper about this, Tonooka,Y,H.Hondo,Y.Uchiyama,T.Ikaga (1998) Comparison Analysis of Fundamental Data for LCA□Energy and Emissions from Material Production Processes, Proceedings of the 3rd International Conference on EcoBalance, Tukuba,Nov.1998 (Yutaka Tonooka, Saitama University)	Rejected: this is a very complicated subject, with the results highly dependent on input assumptions and methods used, and easily varying by a factor of 2. Space limitations do not permit a full discussion; we have simply flagged a few robust points.
6-169	A	30	19	30	19	Add: "However, the relative importance of embodied energy will increase for low energy buildings, because such buildings require much less operating energy and because the initial embodied energy will likely increase. Choosing more energy-efficient materials such as wood structural framing instead of concrete will reduce the embodied energy. The greenhouse gas benefit is not only associated with the reduced embodied energy, but also to cement reaction emissions and the replacement of fossil fuels by biomass residues (Gustavsson et al., 2006)."	Rejected due to space limitations, even though these are all valid and interesting points.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						Reference: Gustavsson, L., Pingoud, K. and Sathre, R. 2006. Carbon dioxide balance of wood substitution: comparing concrete- and wood-framed buildings. Mitigation and Adaptation Stategies for Global Change, 11(3):667-691. (Government of Sweden)	
6-170	A	30	27	0	0	Include case study of a demonstration house built without f-gas containing products received the Austrian environmental prize in 1998. It combined the best features of low energy design with greenhouse gas free products. Calculations compared the greenhouse gas emissions of the house with alternative construction methods, including all of the energy inherent construction, materials, and 50 years of use, on a GWP-20 basis for HCFCs and HFCs. Lang, Guenter (1999) Analyse treibhauserelevanter Emissionen am Bau anhand des Projecktes Passivehausscheibe im Salzkammergut, Salzkammergut, Austria. (Kirsten Macey, Climate Action Network Europe)	Rejected due to space limitations.
6-171	A	31	5	31	49	There is no mention of alternatives in the cooling section: Alternatives to hydrofluorcarbons are increasingly used in a range of cooling eqipment, from isobutane (a hydrocarbon) in domestic refrigerators to CO2 and ammonia in larger applications. Their advantage is that they inherently achieve the lowest direct greenhouse gas emissions impact. Anderson, J (2005) Marketing and use restrictions for HFCs in small refrigerators and freezers, IEEP, Belgium, p. 2. (Kirsten Macey, Climate Action Network Europe)	Noted. The main point that we make is that both the performance of equipment and the impact of any halocarbon emissions need to be considered when evaluating the climatic impact of alternative choices for refrigerants.
6-172	A	31	10	32	11	"Climatic" is listed twice. U.S. Government (Government of U.S. Department of State)	Accepted: corrected.
6-173	A	31	12	31	12	Global Warming Potential is GWP, not GWp (Archie McCulloch, Marbury Technical Consulting)	Accepted: corrected.
6-174	A	31	13	31	14	The "Most" is not needed, as the Montreal Protocol is also phasing out the consumption of all HCFCs. Suggest "HCFCs are being phased out, also for reasons of ozone depletion, but will not be completely phased out of production until 2030 in developed countries and 2040 in developing countries. U.S. Government (Government of U.S. Department of State)	Accepted: deleted.
6-175	A	31	13	31	14	More clarification is needed on the CFC ban, and the generalization about GWP needs to be shown as such. Suggest "Global Warming Potential (GWP) is generally highest for CFCs, which are also being phased out by the Montreal Protocol … ozone layer." then add "The consumption (production plus imports minus exports minus destruction) of CFCs except for critical uses (for example, medical devices) stopped in 1996 in developed countries, while developing	Accepted: added.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						countries have been given to 2010 to eliminate consumption. U.S. Government (Government of U.S. Department of State)	
6-176	A	31	14	31	14	Global Warming Potential is GWP, not GWp (Archie McCulloch, Marbury Technical Consulting)	Accepted: corrected.
6-177	A	31	14	31	15	This sentence does not clearly describe the GWP of these gases. The highest GWP of HCDCs is 2270 plus or minus 800, wheras the highest HFC gas is 11,700. The sentence could be clearer by expressing: "The GWP of CFCs are the highest and while released in much smaller quantities overall, they have high global warming potentials (GWPs), and as a result, at any one site they can be important sources of emissions. (Kirsten Macey, Climate Action Network Europe)	Accepted, but with different wording.
6-178	A	31	14	31	15	The generalization that GWPs of HFCs are lower than HCFCs is not correct. In fact, in most applications the GWP of the typical HFC is HIGHER than the GWP of the typical HCFC, although the net emissions may be higher or lower depending on the design of the system, how much chemical is used, etc. Two examples are the replacement of refrigerant R-22 (direct GWP=1780 per IPCC/TEAP Special Report 2005; indirect ozone-depletion effects would lower that value) with R-410A (GWP=2060) in air conditioning or with R-404A (GWP=3860) in commercial refrigeration. Suggest "The GWP of HCFCs is generally lower than CFCs. The GWP of HFCs are generally lower than CFCs, but are generally slightly higher than that of the HCFCs. U.S. Government (Government of U.S. Department of State)	Accepted: revised and included.
6-179	A	31	14	31	14	The generalization needs to be shown as such. Suggest "The GWP of HCFCs is generally lower than CFCs" U.S. Government (Government of U.S. Department of State)	Accepted: corrected.
6-180	A	31	15	31	17	According to SROC, the combined HCFC and HFC emissions from buildings in 2015 is predicted to amount to 1.3 Gt CO2 eq, hence the value quoted here is misleading and it should be clearly pointed out that it applies to ALL halocarbons. Furthermore, the emission is dominated by HCFCs (60%) and so will fall after 2015 under the requirements of the Montreal Protocol. (Archie McCulloch, Marbury Technical Consulting)	Noted, double checked – our figure is higher (1.5 Gt CO2eq.) because also consider blowing agents.
6-181	A	31	15	31	17	This sentence is not clear as it is dealing with different gases both HCFCs and HFCs, which is confusing to policy makers. The IPCC's Special Report on Safeguarding the Ozone Layer and the Global Climate System states that emissions are increasing in these 2 gases see reference: "in 2002, CFC, HCFC and HFC banks	Noted. Unfortunately we do not have space for giving details for each gas and thus summarize the overall trend from the SROS Report.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						were about 16, 4 and 1 GtCO2-eq respectively. In 2015, the banks are about 8, 5 and 5 GtCO2-eq respectively in the BAU scenario. p. 9 SPM. With regard to projected emissions the report states that "HCFC emissions projected to increase from 0.4 (2002) to 0.8 GtCO2-eq per year (2015), owing to a steep increase expected for their use in (commercial) refrigeration and SAC applications". "Emissions of HFCs are increasing from 0.4 (2002) to 1.2 GtCO2-eq per year (2015)". p. 11 SPM. (Kirsten Macey, Climate Action Network Europe)	
6-182	A	31	18	31	19	The bank in foams is even larger than air conditioning. Suggest "the bank of CFCs in the stock of air conditioners and foams is so large…" U.S. Government (Government of U.S. Department of State)	Accepted: added.
6-183	A	31	21	31	31	This section does not indentify options to reduce emissions from refrigerators which use fluorinated gases. Suggest to include from Special Report: "Isobutane (HC-600) and HFC-134a are the dominate altertive refrigerants for replacing CFC-12 in new domestic refrigeration appliances". The overwhelming majority of efficient fridges in the EU use hydrocarbons. Anderson, J (2005) Marketing and use restrictions for HFCs in small refrigerators and freezers, IEEP, Belgium, p. 4. (Kirsten Macey, Climate Action Network Europe)	Accepted: the section is rewritten assuming the existence of non-halocarbon alternatives to halocarbons in refrigeration.
6-184	A	31	21	31	31	Where this paragraph mentions "heat pumps" it should be made clear that the term is used to mean cooling-only units (often referred to as an "air conditioner") as well as cooling and heating units. Use "air conditioners and heat pumps" and "this equipment" in lieu of "heat pumps" in the first few lines and "the unit" in lieu of "heat pump" in the last few lines. U.S. Government (Government of U.S. Department of State)	Accepted.
6-185	A	31	21	31	22	It is true that for some equipment the lifetime emissions have fallen by a factor of 10 but surely not for all kind of equipment. See e.g. Report of the TEAP Chiller Task Force, May 2004: "Credible values for the fraction of the charge that might be expected to be emitted from CFC chillers range from about 5%/year for equipment 10-20 years old to 7.5%/year for equipment 20-30 years old." Taking into account emission values as low as 1-2% as given by Peixoto et al. 2005 and current default IPCC emission values (best practice 3%) you will not find a decrease by factor 10. Further more you will still find newly manufactured equipment on the market with emission rates of 10% or even more. Hence, the emission rates can not have fallen by a factor of 10. Change sentence to: "Lifetime emissions of refrigerants from cooling equipment, per unit of cooling, have partly fallen significantly during the	Accepted: the factor of 10 is found on page 283 of the IPCC/TEAP report. It says that lifecycle halocarbon use has fallen by a factor of 10, which means that if more is recovered at the end of life than before, emissions could have fallen by an even larger factor. It seems there is a contradiction between the two reports. We have reworded the sentence almost identical to the one suggested.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						past 30 years. However, for some kind of equipment annual emission rates are still as high as 10-15%." (Government of Germany)	
6-186	A	31	22	31	27	The sentence is grammatically incorrect and would be better if broken into two sentences. Also, the statement about halocarbon refrigerants come 2010 needs to be revised because use of non-HFC refrigerants in developed countries will occur beyond 2010. Suggest: "By 2010, it is expected that HFCs will be the only halocarbon refrigerant to be used in air conditioners and heat pumps manufactured in developed countries. The climatic impact of halocarbon emissions from this equipment is estimated..." U.S. Government (Government of U.S. Department of State)	Accepted: split into two sentences, the second sentence was later deleted as provided too detailed information.
6-12	B	31	22	31	23	The authors should confirm that HFC refrigerants will be the only permissible halocarbon refrigerant by 2010 in developed countries. Do the authors mean that HFCs will be the only permissible refrigerant in new equipment? (Government of Australia)	Accepted: revised wording proposed by US and accepted by us allows for the possibility that there might be some non-HFC still used in new equipment (although it is supposed to be banned by then)
6-187	A	31	25	31	25	Could you explain what kWc mean? (Yutaka Tonooka, Saitama University)	Accepted: footnote added, however the whole sentence got cut as provided too detailed information.
6-188	A	31	33	31	33	For clarity, add at the end of the first sentence on line 33: "… however refrigerant leakage is also important to consider." U.S. Government (Government of U.S. Department of State)	Noted. Adding the requested phrase would directly contradict what comes later in the paragraph. Our conclusion is that, for this equipment, the energy-related emissions are in fact far more important, and at the end of the paragraph we highlight the importance of end-of-life recovery of halocarbons.
6-189	A	31	34	31	34	"best practice is about 0.5%/yr": It is our understanding that this is only true for equipment using HCFC-123. This information has to be included here. (Government of Germany)	Noted: but no change is nededed (we give the typical range as 1-2%/yr. and simply indicate best practice as 0.5%/yr. – it need only apply to one case in order to be valid.
6-13	B	31	34	31	36	The authors should explain whether or not their figures for HFC leakage include installation losses. (Government of Australia)	Accepted: the 1-2% has been corrected to read "1-2%/yr", so this implies that any installation losses are not included (the range was changed later to 1-6%/yr. according to the reference provided).

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-190	A	31	35	31	35	It is not clear where the 85% recovery rate and 15-year lifetime assumptions come from. The chiller examples in the IPCC/TEAP Special Report use lifetime assumptions of 15 to 30 years, and recovery rates of 70%, 80%, 95% and 100%. Because ranges are given elsewhere could say "recovery of 70 to 100% of the refrigerant at the end of a 15 to 30-year life, refrigerant leakage..." U.S. Government (Government of U.S. Department of State)	Notes: we checked both reference – Piexoto et al 2005 and IPCC/TAP report – and modified the sentence accordingly.
6-191	A	31	38	31	39	Delete the last sentence -- it only repeats the first sentence of the preceding paragraph. U.S. Government (Government of U.S. Department of State)	Accepted: deleted.
6-192	A	31	41	31	48	Change the whole paragraph because it is misleading. For nearly all application HFC-free foams or other alternatives exist and are widely used. Taking this into account it does not make any sense to only use non-halocarbon foam insulation or non-foam insulation where "additional insulation [halocarbon-blown foam] can be counterproductive from a climatic point of view." For all cases it should rather be decided whether a halocarbon-blown foam or a halocarbon-free foam (or even a non-foam insulation) will be the best choice from a climatic point of view. Usually not using the halocarbon-blown foam will be the best decision. Please refer to e.g. Harnisch et al. (2003): Risks and Benefits of Fluorinated Greenhouse Gases in Techniques and Products under Special Consideration of the Properties Intrinsic to the Substances. Report prepared for the German Federal Environmental Protection Agency by Ecofys GmbH. Öko-Recherche GmbH, Öko-Institut e.V., TU München, Max-Planck Institut für Biogeochemie. (Government of Germany)	Accepted: we did not understand some parts of this comment, but we responded to what we thought was the main thrust of the comment, namely, to highlight that non-halocarbon foams are preferred where-ever this is feasible.
6-193	A	32	36	41	38	A lot of DOE sponsored analysis backs up this general conclusion. U.S. Government (Government of U.S. Department of State)	Noted: Table 6.2 (now 6.6) is summarized based on discussion in section 6.4. Table 6.3 (now 6.7) contains the US study supported by the US DOE. We tried to cover as many countries as possible and not single out any country.
6-14	B	33	5	34	50	The authors should list the countries that are categorised as either "cold climate" or "warm climate". (Government of Australia)	Reject: quite clear association of countries with relatively warmer/colder climate while not possible to them all in the table.
6-15	B	35	18	35	18	The authors should detail which of the 6 inhabited continents was excluded from the assessment done for the WG3 report and provide a citation of that assessment.	Noted: we span all continents except Antarctica, we added clarification “inhabited”.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Government of Australia)	
6-194	A	35	21	35	0	Section 6.6.5 Comment. Surprised to see no mention of the 30 years of experience and data from the U.S. via its Low-Income Weatherization Program which has weatherized some 5 plus million homes. Recommend at least some acknowledgement of DOE work; see http://www.eere.energy.gov/weatherization/ U.S. Government (Government of U.S. Department of State)	Taken into account: the reports of the US Low-Income Weatherization Program were checked. The format of conclusions of the reports does not allow including them into the discussion of national CO2 potentials: the reports estimate the effect in the past, and make projections on the individual building level.
6-195	A	36	5	38	9	There is not any study about Japan listed in the table.However there are some studies in Japan.Most recent and interesting study is "30% CO2 emission reduction from 1990 Kyoto scenario in building sector in Japan" by Kiko-Network (a climate change NGO in Japan). I had collaborated with them and we have symposiums on 16th September in Tokyo and 23rd September in Kyoto. We would write the English summary of it soon. Country Japan Reference KikoNetwork Japan,2006 Type of potential Technical Description of mitigation scenario 34 options,inclding 8 types of technologies for space heating and cooling, 6 types of hot water supply, 2 types of cooking, 3types of lighting, 7 appliances, 3 renewable energies. Potential 240 million tCO2 in 2020 55% Measures with lowest costs N.A Measures with highest potential PVC□Low cost building integrated thin-film□,Low level electricity CO2 emission factor(by renewable and high efficient gas turbine combined cycle), Building envelop thermal performance improvement, BEMS and HEMS, Super heat pumps (including CO2 HP),High efficient lighting (CFLs, LED),High efficient refrigerator (including show case),High efficient appliances (Top Runner products),Solar thermal collectors,Sift to purpose built frat from detached house,Activity change (Office work and shop open time shortening, Office and shop area compactification) Note to 2020 Japan government Kyoto target action plan corresponding Background data of potential □240 million tCO2 in 2020 55% from base line 433million tCO2, which is no reduction, with 2000 year level energy efficiency and CO2EF. 1990 Kyoto Base Line CO2 278 million tCO2 , 2020 with options 193 Million tCO2, reduction 85 million tCO2 30.6% reduced from 1990 Kyoto base line,) (Yutaka Tonooka, Saitama University)	Noted: the potential for Japan was added, however, from another publication provided by our Japanese LA.
6-196	A	37	0	37	0	in case study of China in the table 6.3,in the row of "reference", "ERI and NDRC 2004" should change to "ERI 2004",in the row of "notes", " [1].N.a." should be	Accepted: reference is corrected. However, we did not understand what 'expertise" means so

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						changed to "expertise". (Government of China Meteorological Administration)	could not correct.
6-197	A	37	3	37	7	1) This potential is the case of US$ 100/tCO2. Type of potential defined by Economic is unclear. It is better to specify US$ 100/tCO2. 2) Please refer to (AIM 2004) or (NIES, 2004) as these values are taken from the paper: AIM, 2004: GHG Emissions and Climate Change, National Institute for Environmental Studies, Tsukuba, November. URL: http://www-iam.nies.go.jp/aim/aimpamph/pdf/All1115.pdf. (Note: www-iam, not www-aim; APEIS is the project name and AIM is a model name) (Mikiko Kainuma, National Institute for Environmental Studies)	1. Noted: we now distinguish the economic potential (at negative costs) and technical potential without cost limits. The potential estimates provided by the study are sorted respectively. All terms including definitions of potential types are provided by Chapter 2 (we cannot repeat them due to space limit). 2. Accepted: the reference is corrected.
6-198	A	39	15	0	0	You could add the mitigation estimates of the IEAs Energy Technology Perspectives publ;ication, I suggest the following sentence.. "The IEA has modelled the mitigation potential by 2050 assuming all options in theb uilding sector with a cost up to $25/t CO2 are teken up. Half of all energy savings in the residential sector come from space heating (Figure 2.37). This reflects the impact of more energy efficient regulations for new buildings and energy efficient retrofits of the existing building stock, as well as improvements in heating systems and their operation. Appliances account for about one-fifth of the savings. Savings in the service sector look somewhat different. Space heating still accounts for the largest share, at 40%, but the savings from lighting and other electrical end-uses are more important than in the residential sector. Lighting and miscellaneous electrical end-uses account for 32% of the energy savings. By 2050, the total mitigation potential is estimated at around 7.7 Gt Co2 (allocating upstream savings in the electricity generation sector to erduction in electricity demand), with electric appliances contributing around 2.1 Gt CO2, building envelope measures for around 1.6 Gt CO2, Heating and cooling technologies for around 1.1 Gt CO2, lighting for around 1 Gt CO2, solar heating and cooling for 0.6 GT CO2 and building energy management systems for around 0.2 Gt CO2. (Michael Taylor, International Energy Agency)	Taken into account: Chapters 4-10 report the potential to 2030 and unfortunately the space does not allow including so many details of the potential in 2050. However, we think it is important to include at least one sentence with the overall potential in 2050 from suggested reference (included).
6-199	A	39	40	40	15	Since it´s much more cost effective to reduce emissions in developing countries, much more effort should be put there, since GHG is a global problem, doesn´t matter where it is reduced. However, institutional capacity limitations should be accounted. (Government of Finland)	Noted: we make this point in the chapter.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-16	B	39	55	39	55	Footnote 13: It would be of assistance if the authors provided a brief description of technical, economic and market potential as a reference for Table 6.3, rather than simply citing chapter 2. (Government of Australia)	Rejected: these terms are defined for all end-use sectors in Chapter 2. It would not make sense to repeat the definitions throughout the report.
6-200	A	40	16	41	20	Please give an indication of which technologies contribate most to emission reductions. What are the underlying reasons that emission reduction potentials differ so strong from country to country? (Government of European Community / European Commission)	Accepted: we provide applicability of technologies to different regions Table 6.2 (now Table 6.6). In Section 6.5.4 we summarize technologies supplying the largest savings and justify how and why the potentials differ in different country groups.
6-201	A	40	19	40	30	Not clear what the supply curves are based on? Are they solely based on Sathaye and Meyers hypothesis? What are they? (Philippine de T'Serclaes, International Energy Agency)	Noted: the note to TSU was sent to make sure that sources are attached to the Figures so that readers are not confused.
6-202	A	41	10	47	21	Another key stakeholder not mentioned here: investors. If investors are not convinced that energy savings will "matter in the market" they will not be advocates for energy efficient design, and the result will be, and has been, billions of sub par square footage being designed and built. This community of stakeholders deserves more focus than it has traditionally received. See for example http://www.eere.energy.gov/buildings/highperformance/pdfs/who_plays_who_decides.pdf From that report, for example, see Page xi: "Capital providers set the limits on a project by placing a value on the features and amenities in a building. The key decision point with respect to a new commercial building is establishing the budget and the financing. If energy efficiency or other features are not part of the plan at this point, it becomes very difficult to incorporate them into a project. Especially for large projects, financing arrangements may be very complex and therefore difficult to change once completed. Financing is difficult to change for small projects as well. There is a need to recognize that decisions about energy efficiency must come early and that tools and information are needed to aid in its early adoption." U.S. Government (Government of U.S. Department of State)	Noted: this point is covered in Section 6.7 on Barriers for Adopting Building Technologies and Practices that reduce GHG emissions.
6-203	A	41	47	41	48	It is not clear what air conditioning savings means? (Kirsten Macey, Climate Action Network Europe)	Noted: not relevant any more as text was deleted
6-204	A	42	1	42	22	6.5.5 This part emphasize the plus effect of IDP. However negative effect would happen in case of the combination of two or multiple options.Source is not shown.	Rejected: not sure what the negative effects are. A reference was added at the end of the

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Yutaka Tonooka, Saitama University)	paragraph.
6-205	A	42	24	46	10	Important matter is to describe the quantitative effect quoting papers. Otherwise this part sounds general knowledge only. (Yutaka Tonooka, Saitama University)	Accepted: we made an attempt locate the references and added quantitative effects of co-benefits in almost all subsections of section 6.6. on Co-benefits.
6-206	A	42	39	0	0	Suggest to include the following sentence after '...public works.': In China, replacement of residential coal burning by large boiler houses providing district heating is shown to be among the abatement options providing the largest net benefit per CO2-reduction when the health benefits from improved ambient air are accounted for (Mestl et al., 2005). Mestl, H.E.S., K. Aunan, J. Fang, H.M. Seip, J.M. Skjelvik and H. Vennemo, 2005. Cleaner production as climate investment – Integrated assessment in Taiyuan City, China. Journal of Cleaner Production, 13: pp. 57-70. (Kristin Aunan, Center for International Climate and Environmental Research - Oslo (CICERO))	Accepted: the reference was checked and the sentence was rephrased to correspond to it as proposed.
6-207	A	42	42	0	0	The paper referred to by Staff Mestl et al 2005 (which should be referred to as Mestl et al 2005) does not address indoor air pollution as such, but rather demonstrates how abatement of household sector emissions (an important area source in China) has a relatively larger impact on surface level concentrations and human exposure than has abatement of emissions from high stack sources. A related study in Shanxi, China, however, notes that reduced indoor air pollution probably constitutes an important co-benefit of abatement options within the household sector: Aunan, K., Fang, J., Vennemo, H., Oye, K., and Seip, H.M., 2004. Co-benefits of climate policy – lessons learned from a study in Shanxi, China. Energy Policy 32: 567-581 (Kristin Aunan, Center for International Climate and Environmental Research - Oslo (CICERO))	Noted: we checked the reference proposed and we found that it concerned indoor air pollution, which was not discussed in this section of Chapter, therefore, we do not think it is necessary to add this reference. However, we added another reference of almost the same authors to support the paragraph as suggested by comment 6-206.
6-208	A	42	43	0	0	after '...6.9.1', I suggest to include: Finally, residential combustion represents the second largest source of emissions of carbonaceous aerosols in the world, comprising a quarter of global emissions of black carbon and nearly one fifth of global emissions of organic carbon (Bond et al., 2004). There is increasing evidence that these air pollutants play an important role in the climate system on a regional scale as well as on a global scale (Menon et al., 2002; Lelieveld et al.,	Accepted: we attempted to address this problem in treating combustion of and emission from biomass. We extended a discussion on biomass combustion in "Coal and biomass burning stoves in rural areas of developing countries" in Section 6.4.3.2 on

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						2002; Kaufman and Koren, 2006). Potentially, avoided regional climate change may in some parts of the world constitute an additional important near-term co-benefit of abatement of emissions within this sector. References: Bond, T.C., Streets, D.G., Fernandes, S.D., Nelson, S.M., Yarber, K.F., Woo, J.-H., and Klimont, Z., 2004. A technology-based global inventory of black and organic carbon emissions from combustion, Journal of Geophysical Research, 109, D14203, doi:10.1029/2003JD003697. Menon, S., Hansen, J., Nazarenko, L., and Luo, Y.F., 2002. Climate effects of black carbon aerosols in China and India, Science 297, 2250-2253. Lelieveld, J. et al., 2002. Global air pollution crossroads over the Mediterranean, Science, 298, 794-799. Kaufman Y.J. and Koren I., 2006. Smoke and pollution aerosol effect on cloud cover, Science, 313, 655-658. (Kristin Aunan, Center for International Climate and Environmental Research - Oslo (CICERO))	Space heating systems.
6-209	A	43	16	43	18	Box 6.1 Why is part is written as BOX? (Yutaka Tonooka, Saitama University)	The Box calls attention to this important issue.
6-210	A	43	25	43	25	Replace "2003)" with "2003, Banfi et al. 2006)" (bernard aebischer, ethz)	Noted: however, we exchanged the sentence and thus the reference is not relevant any more.
6-211	A	44	0	44	0	The Buildings Chapter should ADD a section discussing mitigation measures for reducing halocarbon emissions from the buildings sector, and also include the best examples in the summary table (Table 6.5). For example, in the US, EPA is working with the supermarket industry on a voluntary program to reduce refrigerant leakage rates mainly through O&M as well as improved equipment (see USEPA website). Other examples, including programs in developing countries to switch out old chillers, may be found in the IPCC/TEAP Special Report 2005. U.S. Government (Government of U.S. Department of State)	Accepted: we improved the section 6.8.5 on policies affecting halocarbons emissions and discussed their selected examples. Unfortunately, we cannot include examples into Table 6.5 (now 6.10) due to limited space.
6-212	A	44	25	44	29	Less energy costs leads to ability to spend money in other ways, the report doesn´t consider what this will lead to, more consumption => bigger energy use (in other sectors than the building sector) (Government of Finland)	Rejected as the sentence is not supported by literature.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-213	A	45	5	45	15	Social problems caused by bills imposed on tenants with inadequate supply or insulation does not occur only in economies in transition but also with inadequate tariffs in richer countries. In the case of France, large scale development of electric heating in social housing has brough very similar issues where cities have to spend substantial sums for such tenants instead of more adequate social programs. The replacement of old fashioned electric heating is suggested in the handbook for local policymakers edited by the French government (MIES 2003, "Mémento pour les décideurs", Premier Ministre, Paris on www.ecologie.gouv.fr/IMG/pdf/memento.pdf) (ANTOINE BONDUELLE, Université Lille II)	Accepted and considered explicitly in the text.
6-214	A	45	21	45	26	What year data is 30,000 of the excess deaths in UK? (Yutaka Tonooka, Saitama University)	Accepted: the years added.
6-215	A	45	51	45	51	insert additional reference: "(Banfi et al. 2006, " (bernard aebischer, ethz)	Accepted: we checked the reference for its contents and added it.
6-216	A	46	14	46	14	Choice of word: are u sure it has "demonstrated". I think "shown"would be more appropriate.There is actually a problem in demonstrating the cost effectiveness of all the measures which is linked to the difficulty of quantifying ancillary benefits. (Philippine de T'Serclaes, International Energy Agency)	Accepted: exchanged.
6-217	A	46	27	0	0	Table 6.4: Add in last row, last column: "lack of awareness" (bernard aebischer, ethz)	Accepted: added.
6-218	A	46	27	0	0	To complete the table 6.4, a small paragraph on the barrier "public awareness and a proper education of architects and engineers, especially in developing countries" is essential. (Faouzi Senhaji, I.A.V. Hassan II (GERERE))	Noted: this is in 6.8.1.3 on Education, training, and energy audit programs
6-219	A	47	10	47	21	This is true and important, however what we need is to suggest how to resolve the problems. And In this book authors are specially requested to quote references. So could you find any papers describing on the improvement of the process or creation of new market structure? If it is written in the next 6.8 would you add explanation about it here. (Yutaka Tonooka, Saitama University)	Noted: we did provide two examples of solutions at the end of the paragraph.
6-220	A	47	16	47	16	Insert: "Further, many of the components are spplied by different companies, e.g. HVAC systems and controls" (bernard aebischer, ethz)	Rejected: it is not clear that components from different companies cause problems.
6-221	A	47	19	47	19	Reference "Jefferson, 2000" missing in the Reference Chaptre 6.10 (page 87) (bernard aebischer, ethz)	Accepted: the reference was located and added.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-17	B	47	20	47	20	The authors should set out what the "EPB Directive" is. (Government of Australia)	Accepted: abbreviation was spelled out and the reference to Box 6.3. with detailed information on EPBD was provided.
6-222	A	47	23	47	48	Same as above. (Yutaka Tonooka, Saitama University)	Noted: same as above.
6-223	A	47	27	55	28	Replace the phrase "…are often considered the main driver for…" with "…an important driver for…" U.S. Government (Government of U.S. Department of State)	Accepted: exchanged.
6-224	A	47	30	47	31	replace "appliances, while the tenant pays the electricity bill" with "appliances, and decide on building renovation, while the tenant pays the electricity bill and the heating costs" (bernard aebischer, ethz)	Accepted: added.
6-225	A	47	31	47	31	change the word 'he' to 'they' as the landlord could also be a woman. (Kirsten Macey, Climate Action Network Europe)	Accepted: corrected to "he or she".
6-226	A	47	31	47	32	Could add a paragraph or footnote on empirical literature to strenghten point. E.g. "Studies based on surveys in the residential sector by Brechling and Smith (1994) for the UK and by Scott (1997) for Ireland, and by Gruber and Schleich (2007) for buildings in the commercial and services sectors in Germany highlight the relevance of the landlord-tenant problem as a barrier to energy efficiency." Literature is: (i) Brechling, V. and S. Smith, 1994, Household energy efficiency in the UK, Fiscal Studies 15, 44-56.(ii) Scott, S., 1997, Household energy efficiency in Ireland: A replication study of ownership of energy saving items, Energy Economics 19, 187-208. (iii) Schleich, J. and Gruber, E. : Beyond case studies: Barriers to energy efficiency in commerce and the services sectors, Energy Economics (forthcoming) (Joachim Schleich, Fraunhofer Institute Systems and Innovation Research)	Accepted: no space to add more details on the problem, however, we added two of these references supporting the statement.
6-227	A	47	35	47	37	include also 'or who will live and use it'. As the builders and other people who make decisions do not have to live in the houses they build. (Kirsten Macey, Climate Action Network Europe)	Noted: "not using the equipment" is added.
6-228	A	48	5	48	11	Same as above. (Yutaka Tonooka, Saitama University)	Noted: same as above.
6-229	A	48	13	48	25	This part also should be written from the view point to promote the GHGs emission reduction. (Yutaka Tonooka, Saitama University)	Noted: this is a barrier that is directly related to ability to address reductions in GHG emissions.
6-230	A	48	33	48	33	Add: "In some countries it is not allowed that building owners sell distributed	Agreed, however we did not locate references

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						power directly to the building users" (bernard aebischer, ethz)	to support the statement.
6-231	A	48	41	48	41	Add: "In some countries the rental market is regulated in a way that discourages investments in general and energy-efficient investments in particular" (bernard aebischer, ethz)	Agreed: added.
6-232	A	48	47	48	47	Add references: "energy-efficient investments (Weber 2002, Ostertag 2003)" (bernard aebischer, ethz)	Accepted: we added the reference to Ostertag, 2003 however we could not read Weber 2002 as it is in German (+ key literature should be in English).
6-233	A	49	15	49	15	replace "trust" with "trust. This is especially true for private single or multi-family house owners who own only one or a few buildings and thus do not have a professional approach to the construction of new building or to the renovation of existing ones (see Ott et al. 2005)" (bernard aebischer, ethz)	Rejected: too much detail.
6-234	A	49	24	49	26	include 'no information on greenhouse gas emissions' in the section on householders electricity bill. (Kirsten Macey, Climate Action Network Europe)	Noted: this is implied, unfortunately no space to put more emphasis on it.
6-235	A	49	43	50	12	In terms of culture comparison between Japan and Korea is interesting. Comparing with the weather condition energy consumption level per capita in Korea is much higher than Japan. This would come from traditional behavior or life style in Korea, not only from Korea is not Annex-1 country. (Yutaka Tonooka, Saitama University)	Noted: interesting comparison however we cannot include more examples due to space limit.
6-236	A	50	36	50	39	Include reference to Michelle Shipworth (2000) Motivating Home Energy Action - A Handbook of What Works Australian Greenhouse Office, Australia. (Kirsten Macey, Climate Action Network Europe)	Rejected: the handbook does not support the point made; rather it provides a means to reduce GHG emissions.
6-237	A	50	45	50	45	replace "buildings sector in many countries." with "buildings sector in many countries. Even in a country like Switzerland building owners stated in a recent survey financial issues to cover captial needs as barrier to building renovation, sometimes also due to other capital intenstive lifestyle priorities (Ott et al. 2005)" (bernard aebischer, ethz)	Rejected: unfortunately no space for added examples.
6-238	A	51	19	51	19	Add "And it is important to notice that in most cases, several barriers occur for one specific type of energy-efficient investment." (bernard aebischer, ethz)	Rejected: the sentence in text makes the point sufficiently and we have space limits.
6-239	A	51	31	51	31	Add "Due to the multitude and cascade character of the barriers along the value-	Agreed: this is discussed in 6.8.5. (Policy

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						added chain it is important to conceptually bundle the different policy measures to a coherent set i.e. a several barriers have to be removed simultaneously to promote energy-efficiency successfully (see for instance Ott et al. 2005 for a consistent proposal of policy measures)." (bernard aebischer, ethz)	options for GHG abatement in buildings: summary and conclusion). The point was added and supported by the reference Ott et. al. 2005.
6-18	B	51	37	51	38	The authors should explain the difference between an "economic and market-based instrument" and a "financial instrument". (Government of Australia)	Agreed, we explained the title of financial instruments.
6-240	A	52	1	0	0	Table 6.5: 4th row of table (Building Codes): add "Switzerland" second column (bernard aebischer, ethz)	Notes: unfortunately adding one country increased the space so we did not include Switzerland in Building codes, however, we included Switzerland in rows describing 2 other tools (addressing to comments 6-242 and 6-244).
6-241	A	52	1	53	1	Table 6.5 has been splitted into Portrait and Landscape pages. (Muhammad Latif, Applied Systems Analysis Group)	Not a problem with our version.
6-19	B	52	10	52	10	Table 6.5: reference of NAEEEP 2005, should be replaced with "Australian Greenhouse Office, 2005", which is already cited in the chapter. The authors should ensure that 2 separate references are not used to cite the same piece of work. (Government of Australia)	Accepted, corrected.
6-242	A	53	1	0	0	Table 6.5: 10th row of table (capital subsidies...): add "Switzerland" in second column (bernard aebischer, ethz)	Noted: added.
6-243	A	54	1	0	0	Table 6.5: 6th row of table (Awareness): add "Switzerland" in second column, add "www.energieschweiz.ch" in last column (bernard aebischer, ethz)	Noted: unfortunately adding one country increased the space so we did not include Switzerland in Building codes, however, we included Switzerland in rows describing 2 other tools (addressing to comments 6-242 and 6-244).
6-244	A	54	1	0	0	Table 6.5: 3rd row of table (voluntary certification and labelling): add "Switzerland" in second column, add "www.minergie.ch" in last column (bernard aebischer, ethz)	Noted: added.
6-245	A	55	10	55	51	Inclusion of recognition of climate zones to ensure that the codes apply to all areas of a country. (Kirsten Macey, Climate Action Network Europe)	Noted, but we think it is widely accepted that building codes should be different for different climate zones.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-246	A	55	12	57	12	On line 16, add after "Energy Star Buildings" the phrase "… and New Homes labels…" Also, this sentence should be reworded to indicate that, at least for the Energy Star programs in the US, the emphasis is on high performance beyond codes; this is not a by-product of code compliance. An additional discussion is needed of "green building" rating and labeling programs, of which energy efficiency is an important component. Examples include the US Green Building Council's LEED rating, the US Green Globes rating, the UK rating system BREEAM, and others. U.S. Government (Government of U.S. Department of State)	Accepted mostly: more systems are mentioned, but we do not have space for additional detail.
6-247	A	55	26	55	31	Go quickly on an issue which would benefit from higher emphasis: the lack of implementation of existing building codes (Philippine de T'Serclaes, International Energy Agency)	Noted: important point, but no space to elaborate.
6-248	A	55	30	55	31	References missing in the reference section (Chapter 6.10): U.S. Department of Energy, 2001; XENERGY, 2001 (bernard aebischer, ethz)	Accepted: XENERGY is added, US DOE is deleted.
6-249	A	55	40	55	41	Reference missing in the reference section (Chapter 6.10): Ecofys, 2006 (bernard aebischer, ethz)	Accepted: reference was added (Joosen et al., 2006).
6-250	A	56	0	56	0	Box: The first action is inaccurate. The European Directive actually states that "(10) the energy performance of buildings should be calculated on the basis of a methodology, which may be differentiated at regional level, etc."hence it is in direct contradiction with what is stated in the first action of box 6.2. But maybe I misunderstood. (Philippine de T'Serclaes, International Energy Agency)	Accepted: we revised the section.
6-251	A	57	10	57	10	Uerge Vorsatz appears twice and needs to be deleted once (Joachim Schleich, Fraunhofer Institute Systems and Innovation Research)	Accepted: corrected.
6-252	A	57	12	57	16	The material papers are before 2001. Is there more recent papers to be quoted here? (Yutaka Tonooka, Saitama University)	Accepted. The reference of Hicks has been added: (Hicks and Neida, 1999). No more recent work has been found.
6-253	A	57	18	55	20	What is the difference in this sentence between "appliances, equipment and lighting systems" and "installed equipment"? Does this refer to the replacement of "installed equipment" with "new equipment of higher efficiency"? It is not clear. U.S. Government (Government of U.S. Department of State)	Accepted: installed equipment is equipment fixed in the building (HVAC).
6-254	A	57	21	57	21	replace (OPET Network, 2004)" with (OPET Network, 2004), that can be refinanced to a substantial part by reduced energy costs and or even or completly	Accepted, however we skip any text and reference to both additional investment costs

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						by the willingsness to pay of tenants and house purchasers for increased comfort (Banfi et al. 2006). The creation of this label helped to promote energy-efficient new buildings substantially. (bernard aebischer, ethz)	and savings (is already treated extensively).
6-20	B	57	23	57	23	Replace "town" with "city". Canberra is Australia's capital city. (Government of Australia)	Accepted: corrected.
6-255	A	57	35	57	38	Include builders and plumbers here as they are the closest to householders (residential buildings) see www.greenplumbers.com.au (Kirsten Macey, Climate Action Network Europe)	Accepted: included.
6-256	A	57	39	57	39	Source is not written as to education in Japan. (Yutaka Tonooka, Saitama University)	Accepted: we deleted “and practicing holistic education, as in Japan” as we could not locate the reference.
6-257	A	57	40	57	47	Information campaigns do not always motivate consumers to take action. What matters is not so much the amount of information contained in a label, advertisement, or other message but getting the audience to pay attention and take the message seriously. This depends on the way the message is presented, the way information users interact with information sources, their trust in those sources, and the confirming or conflicting information that comes from friends and associates. Michelle Shipworth (2000) Motivating Home Energy Action - A Handbook of What Works Australian Greenhouse Office, Australia. (Kirsten Macey, Climate Action Network Europe)	Accepted, we added a sentence “Incentives for consumers are generally needed along with the information programs to have significant effect (Shipworth, M. 2000).” and the reference.
6-21	B	58	39	58	39	Replace "2000" with "2002". A citation for this program is also necessary. The most appropriate reference is National Appliance and Equipment Energy Efficiency Program, "Money isn't all you're Saving: Australia's Standby Power Strategy 2002-2012" Commonwealth of Australia 2002. It should also be noted that the IEA had been pushing for a One Watt target well before the cited reference of 2002. (Government of Australia)	Accepted: 2000 has been replaced by 2002. The reference has been added: Commonwealth of Australia, 2002. It turned out that the IEA work was already quoted right before, but the reference was missing in the reference list. The reference has now been added: IEA, 2001: Things that go blip in the night. Standby power and how to limit it. Paris. IEA/OECD.
6-258	A	59	15	59	29	Rating and labelling systems also need to compare like with like, it will be difficult for consumers to make choices if for example washing machines are tested on	Noted, ut for given label system, all equipment is tested according to the same

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						different cycles and temperature of water. (Kirsten Macey, Climate Action Network Europe)	cycle.
6-259	A	59	38	59	38	Meyers,2002 does not appear in the reference list at p88. (Yutaka Tonooka, Saitama University)	Accepted: the reference was added.
6-260	A	59	41	0	0	6.7.8 Education Professional and technical education in most parts of the world, teach and reinforce the traditional methods. Change is urgently needed, coupled with armonization of practices and standards, taking into account the local practices, circumsntances and legal framework. Also, development of CAD tools that will facilitate simulation of emission patterns from construction materials and architectural designs. (Valentin Bartra, Instituto Andino y Amazónico de Derecho Ambiental)	Rejected due to space limitations.
6-261	A	59	41	59	41	6.7.8 Education Professional and technical education in most parts of the world, teach and reinforce the traditional methods. Change is urgently needed, coupled with armonization of practices and standards, taking into account the local practices, circumsntances and legal framework. Also, development of CAD tools that will facilitate simulation of emission patterns from construction materials and architectural designs. (Valentin Bartra, Instituto Andino y Amazónico de Derecho Ambiental)	Rejected due to space limitations.
6-262	A	60	8	60	10	Add the Following sentence. " For example, as a result of first "Top Runner Program" in domestic air-conditioner in Japan, efficiency of air-conditioner below 4kW has been improved 67% as an average in 2004 compared with 1997." (Makoto Kaibara, Matsushita Electric Industrial Co,. Ltd.)	Rejected: interesting example, but unfortunately no space.
6-22	B	61	7	61	7	Replace "Australian Program" with "Australian National Appliance and Equipment Energy Efficiency Program". In addition the cited reference of 1999 is no longer current. A number of new work plans have been implemented since 1999. A more up-to-date reference can be found at www.energyrating.gov.au (Government of Australia)	Accepted: the sentence was changed and now reads: "Recently, Australia transformed its S&L program “Australian National Appliance and Equipment Energy Efficiency Program” in order to aggressively improve energy efficiency (National Appliance and Equipment Energy Efficiency Committee, 2006)." Reference has been updated: National Appliance and Equipment Energy Efficiency Committee, 2006.
6-263	A	61	36	0	0	In keeping with the main topic of this chapter, reword this sentence as follows:	Accepted: rephrased as proposed.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						Voluntary measures can cover equipment (e.g., white goods, HVAC, electronics, and electric motors), building design and operation, and public and private sector energy management policies and practices. Examples include XXX in the EU and the Energy Star programs in the US and (for voluntary appliance labeling) several other countries. U.S. Government (Government of U.S. Department of State)	
6-264	A	62	14	63	15	Over all 6.8.3.1 More quoted material should be shown. (Yutaka Tonooka, Saitama University)	Accepted, however the section is very much shortened and the present reference is enough to support it.
6-265	A	62	16	62	20	No mentioning of the social discount factor. Although it might have been settled in other chapters; still need to justify it here (refer back to the chapter which deals with it) (,)	Noted: no longer relevant because section was shortened.
6-266	A	62	16	62	34	No quotation? (Yutaka Tonooka, Saitama University)	Accepted, however, the first paragraph was shortened and the second was cut. We think that at the present state of this section, the reference provided is enough.
6-267	A	62	22	62	22	As to price elasticity in UK, isn't there any other new paper after 1998? (Yutaka Tonooka, Saitama University)	Noted: two other figures supported by fresher sources are added (the Netherlands and the state of Texas).
6-268	A	63	19	63	19	60,000 GWh = could be written 60TWh/yr (Yutaka Tonooka, Saitama University)	Accepted: corrected, however the text is revised and this figure is not used any more.
6-23	B	64	1	64	10	Figure 6.6: The bar for Australia that shows a significant component of electricity prices for Australian households consists of a VAT (or Goods and Sales Tax as is the case in Australia) is incorrect. The authors need to review the referenced publications and amend the figure. (Government of Australia)	Accepted: there was a mistake in the background data for the figure. The mistake is corrected.
6-269	A	64	14	64	14	(Markandya,2000) (Yutaka Tonooka, Saitama University)	Accepted: we put the reference into the brackets.
6-270	A	65	25	65	31	In this context it is said that the effect of energy subsides which switch away from agricultural residues to LPG for example could be positive. However could we say so simply? In case of China fuel switching from agricultural residue to LPG in rural area caused by increasing of disposal consequently affect increasing emissions of GHGs from biomass burning of agricultural residues on the land field, which emits much of GHGs or aerosols, for example CH4 and BC.	Noted: but nuance is already introduced in second sentence of the paragraph.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Yutaka Tonooka, Saitama University)	
6-271	A	65	35	65	39	Should give more details on the nature of the financial instruments (Philippine de T'Serclaes, International Energy Agency)	Rejected due to space limit.
6-272	A	66	21	66	29	Boardman,2004 a or b , which? (Yutaka Tonooka, Saitama University)	Accepted: both references were checked – one was deleted.
6-273	A	66	21	66	21	New crediting conditions by KfW Group for the Climate Protection Program: now buildings built before 1984 are included [http://www.kfw-foerderbank.de/EN_Home/Housing_Construction/KfWCO2Buil.jsp, 14.08.2006]. Replace "1979" by "1984" (Government of Germany)	Noted: the reference (KfW Group, 2006) was added.
6-24	B	67	11	67	11	The sentence should be more positive about the potential leadership role of Government. Suggest sentence read "Indirect beneficial impacts occur when Governments act effectively as market leaders". (Government of Australia)	Accepted, but we do not feel the real difference. The sentence "Indirect savings occur in two ways when government t serves as a market leader in two ways." was replaced by "Indirect beneficial impacts occur when Governments act effectively as market leaders."
6-25	B	69	44	69	44	Insert "the Australian State of" between "Italy and" and "New South Wales". (Government of Australia)	Accepted, however, was canceled back due to shortage of space.
6-276	A	70	0	0	0	Figure 6-7. The figure is not clear as to whether these are constant or nominal dollars. The figure is labeled “Annual Budget for R&D in energy conservation” but then alludes to an IEA RD&D database. In the U.S, R&D and RD&D will yield very different amounts – demonstration brings with it much more money – so clarify is essential. U.S. Government (Government of U.S. Department of State)	Accepted, however no longer applicable – we took out the figure.
6-274	A	70	25	70	44	Here many effective technologies are listed up as examples.Are these examples well balanced or not? In l31 “high performance ground source reversible heat pumps” is listed.However for example CO2 heat pump for hot water supply(applicable for space heating as well) or more general high COP heat pumps might have larger energy saving and emission reduction than ground source one alone. So could you re-consider what technologies to be list up? From l41 to 44 “The very large and very diverse stocks of existing buildings with	Noted: although not exhaustive, we think the categories listed are some major areas for R&D. Accepted: "ground source" has been removed. Taken into consideration: paragraph was

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						poor energy efficiency ----."I think this part could be described more clearly and with specific examples is better. See p41 l42 to 45 "Almost all studies examining --- for district heat.Olso see p21 l14 to 24 "Therefore, district heating system upgrades are a top energy policy priority in these(transition economics countries)." "Acording to the IEA --- DH more efficient could save 350 million tons of CO2 ---." Not only DH, but the thermal performance improvement of existing poor energy efficient building in the cities of cold region might have a large potential. So could you write more clearly about this? It is described that there is big room to improve ortance of improvement. (Yutaka Tonooka, Saitama University)	removed. Rejected: this is existing technology.
6-275	A	70	32	0	0	What analysis indicates that 80% whole house and whole building reductions are possible from efficiency and conservation? Analysis by DOE for new residential construction suggests 65-70% reductions are possible, with the balance provided by integrated PV systems. Analysis for commercial buildings, which are more core dominated, suggests that on average the reductions will be less than for residential. U.S. Government (Government of U.S. Department of State)	Accepted: we cite Section 6.4 as our justification, we exchanged "more than 80%" with "up to 80%".
6-277	A	71	5	73	18	A factor missing in this discussion is simple population growth. It isn't just that service demands are increasing. So is the number of people demanding all the services. Efficiency's impacts are simply overwhelmed by the effect of scale. This is one of the two or three biggest challenges in GHG mitigation, along with energy use per capita and the carbon intensity of energy use, and it should be clearly stated as such here. U.S. Government (Government of U.S. Department of State)	Noted. This is a general point that could be covered in one of the cross-cutting chapters.
6-278	A	71	12	72	13	The phase-out is not in use but consumption. Suggest "timed phase-out in the consumption of HCFCs, with industrialized…" U.S. Government (Government of U.S. Department of State)	Accepted, however the sentence was taken out later.
6-279	A	71	19	72	7	This is an excellent description of the measures to control the use of HCFC and HFC refrigerants. (Archie McCulloch, Marbury Technical Consulting)	Noted: thanks☺
6-280	A	71	21	71	22	Change sentence to : "For modern and properly serviced cooling equipment, however, the climatic effect of halocarbon emissions can be as small as a few to 5 percent compared to...."	Accepted, however, later the whole paragraph was rephrased and sentence was deleted.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						(Government of Germany)	
6-281	A	71	25	0	0	The Montreal Protocol did not ban use, although certain regional regulations did as noted. Also, need to indicate that this phase-out is not yet completed. Suggest "Due to the on-going international phase-out of the production of CFC and HCFC refrigerants, manufacturers..." U.S. Government (Government of U.S. Department of State)	Accepted, however, later the sentence was taken out.
6-282	A	71	29	72	7	The current text solely concentrates upon the EU and EU regulations. I would suggest the following addition: A number of countries have established legislative and voluntary regimes to control emissions and use of fluorinated gases : In Europe, a number of countries have existing policies that aim at reducing leakage or discouraging the use of refrigerants containing fluorine. An example of the first policy can be found in the Netherlands where there are regulations to minimize leakage rates, through improved maintenance, use of qualified personnel, and regular inspection. As result of this policy the average refrigerant leakage rate has decreased from 30% in 1990 to 4.5% in 1999 (Enviros, 2002). Examples of the second policy are: substantial taxes for refrigerants containing fluorine in Scandinavian countries, and legislation in Luxembourg that requires all new large cooling systems to use natural refrigerants (Harmelink et al., 2005). Some countries such as Denmark and Austria have banned the use of HFCs in selected air conditioning and refrigeration applications. In June 2006, the European Regulation 842/2006 on certain fluorinated greenhouse gases entered into force and sets minimum standards for inspection and recovery (EC, 2006). All medium and large stationary air-conditioning applications in Europe will be required to use certified and trained service personnel and to assure recovery of refrigerants at the end-of-life (Harmelink et al., 2005). In the USA, the US Clean Air Act that states that HFCs shall not be vented from equipment during service, repair, or maintenance. This statute is enforceable without any implementing regulations. Similar statutes for CFCs and HCFCs have been enforced through EPA regulations requiring recovery, recycling, reclaim, or proper disposal; certification of service contractors; restriction on sales of small containers of refrigerants; and leak repair requirements. The EPA has, as yet, not issued similar regulations for HFCs. Japan, as part of its National Action Plan to halt global warming (established in 1998 and subsequently revised), has established a target to limit HFC, PFC and SF6 emissions. Measures to meet this target include voluntary action plans by	Accepted: we shorted the EU and added elements of policies having place outside of the EU from suggested information.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						industries, mandatory recovery systems for HFCs used as refrigerants (since April 2002) and the research and development of alternatives. The Japan Refrigeration and Air Conditioning Industry association/ Japan Association of Refrigeration and Air Conditioning contractors have agreed a 10% reduction in HFC leakage during production by 2010 and the Japan Vending Machine Manufacturers Association have agreed a leakage during production target of less than 0.75g per unit. Australia has developed an ozone Protection and Synthetic Greenhouse Gas Management Act for industries covered by the Montreal Protocol on Substances that deplete the ozone layer and extended voluntary arrangements for non-Montreal Protocol industries. Measures include supply controls though the licensing of importers, exporters and manufacturers of both gases and pre-charged refrigeration and air-conditioning equipment; end use regulations on handling, use, recovery, sale and reporting are in place. Australia also has an established voluntary technician certification programme and an organization, Refrigerant Reclaim Australia for the collection and destruction of used and degraded HFCs. Canada has established a National Action Plan for the Environmental Control of ODS and their Halocarbon Alternatives (NAP). This ensures that HFCs are only used in applications where they replace ODS and requires recovery, recycling and reclamation for CFCs, HCFCs and HFCs. Furthermore, under the Environmental Code of Practice for elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, technicians must be trained in proper handling. (Nick Campbell, ARKEMA SA)	
6-26	B	71	29	72	7	This section on existing policies to reduce F-gas leakage only uses European examples. The authors should review the policy literature and provide other non-European examples of such policies. (Government of Australia)	Accepted: see comment 6-282.
6-283	A	71	38	72	5	Please change sentence to :" An important policy is the European directive …". The directive is not longer in preparation. (Government of Germany)	Accepted: corrected.
6-284	A	71	39	72	7	Text says "policy in preparation" but I believe the policy is now finalized although countries may need to develop regulations to implement the policy directive. U.S. Government (Government of U.S. Department of State)	Accepted: the text revised and corrected.
6-285	A	72	6	73	7	Delete sentence that begins “However, so far only…” ADD to the beginning of the	Rejected: current wording better reflects our

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						next sentence: "Despite these policies, in most developed…" U.S. Government (Government of U.S. Department of State)	intentions.
6-286	A	72	8	72	0	Another existing policy for reducing emissions from stationary refrigeration, air conditioning, and heat pump applications is the recovery and destruction of halocarbons contained in those applications. Japan has promoted and strenghened the recovery and destruction of CFCs, HCFCs and HFCs contained in stationary refrigerators, air conditioners and heat pumps since 2001. These two sentences could be added as the last paragraph of Section 6.8.4.1 and similar measures in other countries could be referred to in the same paragraph. References are as follows: http://www.env.go.jp/en/laws/global/ozone1.pdf (Fluorocarbons Recover and Destruction Law) http://www.env.go.jp/en/earth/ozone/srdj.html (The amount of recovered and destroyed fluorocarbons) (Government of Japan)	Accepted: we added the example of Japan (also see comments 6-282).
6-287	A	72	11	72	24	Text concentrates only on the EU and EU regulations. I would suggest the following: In many applications it is cost-effective to switch to alternative, non-HFC blowing agents (Harmelink et al., 2005). Furthermore, such changes, in many cases, do not significantly affect the quality of insulation. Within the European Union, Denmark and Austria have introduced legislation to ban the use of HFC for the production of several foams (Cheminfo, 2004). In June 2006, the European Union Regulation 842/2006 on certain Fluorinated Gases entered into force that is designed to limit emissions and certain uses of fluorinated gases (EC, 2006). This Regulation will ban the use of HFC One-Component Foam from 4 July 2008 except where required to meet national safety standards. Emissions of HFCs from existing, installed insulation will mainly occur during disposal, several decades from now, generally leading to a total loss to the atmosphere of the remaining blowing agent unless effective measures for their recovery or destruction are in place and enforced. Japan, as part of its National Action Plan to halt global warming (established in 1998 and subsequently revised), has established a target to limit HFC, PFC and SF6 emissions. Measures to meet this target include voluntary action plans by industries, the Japan Urethane Raw Materials Association/ Association of Polyurethane Foam Industry has agreed a target reduction of 10% HFC consumption from business as usual in 2010; the Japan Phenol Foam Association has agreed the same target. Measures include: improved containment during the production process, less blowing agent per product, improved productivity per	Accepted: the discussion of the EU was shortened while examples of other countries were added.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						product and the use of non-fluorocarbon low GWP alternatives. The Extruded Polystyrene Foam Industry Association has agreed a 11.8% reduction of HFC consumption from business as usual in 2005 and the High Expanded Polyethylene Foam Industry Association 2% reduction in HFC consumption by 2010. Australia has developed an ozone Protection and Synthetic Greenhouse Gas Management Act for industries covered by the Montreal Protocol on Substances that deplete the ozone layer and extended voluntary arrangements for non-Montreal Protocol industries. Measures include supply controls though the licensing of importers, exporters and manufacturers of HFCs (Nick Campbell, ARKEMA SA)	
6-27	B	72	27	72	28	The authors should confirm, and note in the report that the only region that uses SF6 as a sound-insulating glazing is Europe. (Government of Australia)	Noted: the paragraph regarding SF6 in glazing was removed (because of minor importance).
6-288	A	72	43	73	0	The broad conclusions listed in the paragraph beginning p 72, line 43 are not well justified by the discussion in the previous pages, the underlying literature, or the summary entries in Table 6.5. Nor is it sufficiently emphasized that both effectiveness (CO2 reduction) and cost-effectiveness (cost per ton avoided) vary greatly WITHIN broad program categories, maybe as much or more than they vary among categories. Questions remain on several specific conclusions: -that building codes and tax exemptions achieve the highest CO2 savings -that subsidies are the least cost-effective (does this mean general subsidies of energy bills, or also targeted rebates for the purchase of efficient appliances and buildings?) -that tax reduction are more effective than [energy] taxation The Executive Summary to this Chapter does not repeat any of these specific findings; the broader wording in that Summary seems to be more consistent with (and better supported by) the material cited in the text and summarized in Table 6.5. U.S. Government (Government of U.S. Department of State)	A. Noted: we double checked this statement. These tools are among the most effective in terms of CO2 reductions. B. Noted: we reviewed this statement, subsidies are the least cost-effective. Also, we made clear that this is investment subsidies. C. Noted: left as it was, but explained that tax reduction meant tax reduction for investing in energy efficiency. D. Noted: we have a statement on policies providing the largest CO2 reductions, unfortunately the space does not permit to include more details.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
6-289	A	72	47	72	50	Pretty strong assertion on the different effectiveness of the instruments. Would benefit from direct references here (Philippine de T'Serclaes, International Energy Agency)	Accepted: we moved Table 6.5 to this section to make clear that the statements were derived from a review of many evaluations.
6-290	A	72	48	72	49	Include that voluntary programs may not be as effective section: 13.2.1.3 (Kirsten Macey, Climate Action Network Europe)	Rejected: data show voluntary programs can be effective.
6-291	A	73	1	41	22	The maximum savings achievable at net negative cost – 60% in developing countries and 25% in developed countries – are NOT CONSISTENT with the numbers shown in Table SPM2 for the Buildings sector. That Table does not break out the (Scenario B2) baseline between developed and developing countries, but taking all countries together, the combined savings at net negative costs are shown as 3200 (million metric tons?) out of 15.0 GtC02, or 21%. There is no weighted average of 25% and 60% that can yield this result. Are the earlier percentages based on a different baseline scenario (A1 rather than B2)? Finally, if the Chapter sections cited in brackets on p 13 line 5 [6.4, 6.5] are intended as the source of these numbers, this is not correct – the relevant chapters/sections and data tables should be cited. U.S. Government (Government of U.S. Department of State)	Accepted: we provided a proper methodology now how we came up with the estimate of the global potential and other related figures. Note, that first, the savings are **up to 60%** (we decreased slightly this figure according to our latest revision) for developing countries and **up to 25%** for developed countries (not at this costs); second, the global potential estimate is based on **average** rather than **maximum** savings.
6-292	A	73	7	73	7	IEA 2003 ?? It is not quoted in the references at the end. Don't forget to quote it. (Philippine de T'Serclaes, International Energy Agency)	Accepted: no, this is another reference. The reference was corrected and added to the reference list.
6-293	A	73	51	74	6	ADD at the end of this section on RD&D a brief discussion of the need to determine whether investments in R&D are at a level commensurate with the challenge to achieve significant long-term reductions in emissions from this sector. This includes RD&D on adapting technologies to the widely varying circumstances in developing as well as developed countries. U.S. Government (Government of U.S. Department of State)	Noted, however, no literature on the subject was located.
6-28	B	74	36	74	36	Delete "fair" as this implies a value judgement by the authors. (Government of Australia)	Accepted: deleted.
6-297	A	76	0	0	0	suggest to add some non english references to this impressive list. (Faouzi Senhaji, I.A.V. Hassan II (GERERE))	Noted: we have included many references to many authors from many countries, but the relevant literature is in English.
6-294	A	76	11	0	0	Box 6.4. The description of the Japanese Cool Biz campaign is a strong case study which deals with mitigation and adaptation. The Cool Biz campaign has shown remarkable performance in its implementation expense versus CO2 reduction effectiveness ratio. Due to this effectiveness, it is suggested that a description of the	Noted: unfortunately no space in SPM to discuss individual policies, however they may be very interesting.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						Cool Biz campaign be given in the SPM as an example for policy makers as a low-cost, highly effective, co-beneficial adaptation, mitigation policy strategy. (Government of Japan)	
6-29	B	76	11	76	13	Box 6.4: The statement that "CO2 emissions were reduced by app. 460 Mt in 2005" seems incorrect as it seems incredibly high. If this were the case then, on the basis of the following formula (12x460 million tonne/ 125 million) it would give Japan a per capita CO2 emission of 44 tonnes, without any commercial or industrial emissions. The authors should review this box to determine if there has been an error in translation of units, as the figure seems too high by a factor of 100. (Government of Australia)	Accepted: checked – it is 460,000 tons, corrected.
6-295	A	76	24	76	24	Aebischer, B., G. Henderson and G. Catenazzi, 2006: Impact of climate change on energy demand in the Swiss service sector - and application to Europe. Paper presented at the International Conference on Improving Energy Efficiency in Commercial Buildings (IEECB'06), Frankfurt, Germany, 26 / 27 April 2006. http://www.cepe.ch/research/projects/projections/IEECB%2706_paper_Aebischer_9-3-06.pdf (bernard aebischer, ethz)	Noted: reference was not included since we did not include more text on related issue.
6-296	A	76	24	76	24	Aebischer, B., and G. Catenazzi, 2006: Energieverbrauch der Dienstleistungen und der Landwirtschaft. Ergebnisse der Szenarien Ia und Ib und Entwurf der Ergebnisse der Szenarien II, III und IV, Stand: 06.06.06. Bundesamt für Energie, Bern http://www.bfe.admin.ch/php/modules/publikationen/stream.php?extlang=de&name=de_404144966.pdf (bernard aebischer, ethz)	Rejected: we do not site this paper as we did not added related text.
6-298	A	77	25	77	25	Baldini, L., Leibundgut, HJ. 2005: Increasing the Effectiveness of Building Ventilation System Through Use of Local Waste Air Extraction. Conference Paper, Clima 2005, Lausanne (bernard aebischer, ethz)	Rejected for space reason.
6-299	A	77	27	77	27	Banfi, S., Farsi M., Filippini, M. Jakob, M. 2006: Willingness to pay for energy-saving measures in residential buildings. Energy Economics xx (2006) xxx - xxx, In Press (bernard aebischer, ethz)	This is the reference to support the comment 6-215: checked, accepted and added.
6-300	A	85	27	85	27	Jakob, M., Baumgartner, A., Menti, U., Plüss, I., 2006: Grenzkosten bei forcierten Energie-Effizienzmassnahmen und optimierter Gebäudetechnik bei Wirtschaftsbauten (Marginal Costs of Energy-Efficiency Measures and Improved Building Technology For Buildings of the Commercial Sectors).	Agreed: reference is checked and added.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						CEPE ETH Zurich, Amstein+Walthert, HTA Luzern on behalf of Swiss Federal Office of Energy (SFOE), Zürich/Bern (bernard aebischer, ethz)	
6-301	A	87	10	87	10	Lenel S., Gemperle, S. et al. 2004: Praxistest Minergie - Erfahrungen aus Planung, Realisierung und Nutzung von MINERGIE-Bauten. Konferenz Kantonaler Energiefachstellen (Editor), St. Gallen, Switzerland (bernard aebischer, ethz)	Rejected: unfortunately, the key literature in English and it is difficult for us to translate so many papers in German.
6-302	A	88	18	0	0	"Comment on reference title: Firstly, the reference names in these chapters are different, i.e.' IPCC' in Chapter 5, 'Metz, B., L. Kuipers, et al' in Chapter 6, and 'IPCC/TEAP' in Chapter 7. These three names are the same literature. I think 'IPCC/TEAP' described in Chapter 7 is better. Secondly, reference titles in the text should also be identical. Thirdly, please check other reference titles which might have the same confusion. (Koichi Mizuno, National Institute of Advanced Industrial Science and Technology)	Noted: corrected in our chapter to IPCC/TEAP; the reference is other Chapters needs to be checked by TSU.
6-303	A	89	33	87	33	Ostertag, K. 2003: No-regret Potentials in Energy Conservation - An Analysis of Their Relevance, Size and Determinants. Physica-Verlag, Heidelberg New York (bernard aebischer, ethz)	Agreed: reference is checked and added.
6-304	A	89	36	87	36	Ott W., Jakob M., Baur M., Kaufmann Y., Ott A., Binz A. (2005). Mobilisierung der energetischen Erneuerungspotenziale im Wohnbaubestand, on behalf of the research program "Energiewirtschaftliche Grundlagen (EWG)" of the Swiss Federal Office of Energy (SFOE), Bern (bernard aebischer, ethz)	Accepted: the reference is checked and added (comment 6-239).
6-305	A	93	41	93	41	Weber, L. 2002: Energie in Bürogebäuden: Verbrauch und energierelevante Entscheidungen, vdf Hochschulverlag AG an der ETH Zürich, ISBN 3 7281 2819 8 (bernard aebischer, ethz)	Rejected: unfortunately, the key literature is in English.
6-306	A	93	48	93	48	Wellig et al. (2006). Verdoppelung der Jahresarbeitszahl von Klimakälteanlagen durch Ausnutzung eines kleinen Temperaturhubes. Ernst Basler und Partner im Auftrag des Forschungsprogramms UAW des Bundesamts für Energie (BFE), Zürich/Bern, Schweiz. (bernard aebischer, ethz)	Rejected: unfortunately, the key literature in English and it is difficult for us to translate so many papers in German.
6-307	A	94	17	94	17	Could "Xenergy, 2001" be this one? "Xenergy, 2001: Impact Analysis of the Massachusetts 1998 Residential Energy Code Revisions. Prepared for the Massachusetts Board of Building Regulations and Standards, Boston." see Website:	Accepted: yes, thank you.

Chapter-Comment	Batch	From Page	From Line	To Page	To line	Comments	Considerations by the writing team
						www.energycodes.gov/implement/ pdfs/Massachusetts_rpt.pdf (bernard aebischer, ethz)	