



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE



Special Report on Renewable Energy Sources and Climate Change Mitigation

Expert Review of the First Order Draft
Dec 14, 2009 – Feb 8, 2010

Chapter 7

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¹ see <<<http://ipcc.ch/pdf/ipcc-principles/ipcc-principles-appendix-a.pdf>>>, Section 4.1 and clarification in decision 8 on procedures taken at the 33rd Session of the Panel <<http://www.ipcc.ch/meetings/session33/ipcc_p33_decisions_taken_procedures.pdf>>

**Expert Review of First-Order Draft
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Special Report on Renewable Energy Sources and Climate Change Mitigation, First Order Draft

Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Consideration by the writing team
Twidell (AMSET Centre)	7	4	4	-	-	-	-	-	add after supply '□supply, instasllled capacity is now increasing at about 25% per year worldwide, and that...	We will add related text not here, but instead under the point "the wind energy market has expanded rapidly", also in the ES
Vahrenholt (RWE Innogy GmbH)	7	4	43	4	44	-	-	-	""(□) wind electricity has been successfully integrated into existing electricity networks without compromising system reliability"" (up to the current presentation level). "	Accepted
Kiviluoma (VTT Technical Research Centre of Finland)	7	4	20	-	-	-	-	-	""Despite these developments"" --> ""Since these developments are recent""	Partially Accepted. Let's use the word "Nonetheless" instead.
Kiviluoma (VTT Technical Research Centre of Finland)	7	4	36	-	-	-	-	-	""inaccessible"" --> ""less feasible""	Accepted
Gagnon (Hydro-Quebec)	7	4	46	-	-	-	-	-	"...of demand """, even reaching 100% in highly interconnected Denmark.""	Spain has exceeded 50% also. Need to fix this text in integration section as well.
Kheshgi (ExxonMobil Research and Engineering Company)	7	4	6	4	9	-	-	-	"Does this statement that wind 'can' be cost-competitive consistent with wind generally not being cost-competitive with other forms of power generation? If so, then this statement hides the more general conclusion on cost and should be revised. The recent US NRC (2009) report 'Electricity from Renewable Resources' which was part of the America's Energy Future study found that primary current barriers to renewable energy include cost-competitiveness although wind is generally the least costly of renewables for electricity. Suggest that this be the summary statement on wind cost unless reasons can be given in the chapter to invalidate the NRC conclusion. Page 29 of this chapter highlights that for wind, cost-competitiveness is an important barrier; suggest this be stressed in the Executive Summary. "	We will clean up this and related text elsewhere.
Vahrenholt (RWE Innogy GmbH)	7	4	8	4	9	-	-	-	"IPCC: ""(□) no fundamental barriers exist that preclude increased levels of wind penetration into electricity supply systems."" RWEI objections: Volatility, cost of shut down, energy needed for balancing the grid. "	We will alter the text to be clear on meaning. We are not saying that concerns do not exist, or that active management is not needed. We are trying to say that these are not impassable barriers, but instead are issues that can be resolved at some reasonable cost up to moderate penetrations. We will try to make this more clear.
Paredes (Inter-American Development Bank)	7	4	34	4	36	-	-	-	"It can be true that the wind resource can be far from consumption centers, but that applies as well to fossil fuels to a greater extent. While most of the world population lives in big cities in coastal regions, with a commonly good wind resource offshore, fossil fuels have to be transported long ways incrementing emissions. This ""disadvantage"" of the wind resource should be put in context taking into account transport for fossil fuels."	Not really appropriate to compare wind to fossil resources here. Also, rail trasport for coal or barge for natural gas is lower cost than transmission for wind. We will note the offshore wind resource in this portion of the ES, however, which partially addressed this point.
Kheshgi (ExxonMobil Research and Engineering Company)	7	4	3	4	3	-	-	-	"On the 1.5%, it would be good if each renewable energy source reported its contribution on a comparable basis including by region. If 1.5% in 2008, how much for each of the other contributors? "	Agree on comment, but wind chapter cannot do this for the other chapters. We can suggest it. Unfortunately, we cannot offer comprehensive regional data, though we offer data for a number of countries in Figure 7.13
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	4	3	-	-	-	-	-	"replace ""at the end 2008"" with ""till the end 2008""	We will consult our british speaking colleagues on the appropriate terminology. This will affect similar language offered later in the text.

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Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	4	19	-	-	-	-	-	"replace ""ofshore wind"" with ""offshore wind energy"""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	4	25	-	-	-	-	-	"replace ""under-represented"" with ""under-exploited"""	Let's use different language altogether to be more clear "and in regions with little wind energy development to date"
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	4	5	-	-	-	-	-	"replace ""wind"" with ""wind energy"""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	4	7	-	-	-	-	-	"replace ""wind"" with ""wind energy"""	Accepted
Kiviluoma (VTT Technical Research Centre of Finland)	7	4	6	4	8	-	-	-	"Wind regimes where wind power can be cost competitive without subsidies are very rare. Maybe: ""While in excellent wind resource regimes wind power can be cost-competitive with other forms of electricity generation, in most regions policy measures are required to make wind power attractive investment opportunity. No fundamental technical..."""	Yes, we will clean up this and related text elsewhere.
Twidell (AMSET Centre)	7	4	30	-	-	-	-	-	.. status of the wind turbine and grid supply technology, amongst □ [i.e capability to accept variability]	Will not make change proposed here, as we are reporting a broader form of technical potential. However, we will make more clear that we are reporting broader technical potential, and that realizable potential is lower due to lots of considerations, and barriers. Barriers comment made above may also fit in this section.
Twidell (AMSET Centre)	7	4	17	-	-	-	-	-	add 'China' ..'additions of Europe, United Staes and China.'	Accepted
Twidell (AMSET Centre)	7	4	24	-	-	-	-	-	add the per capita rankings also, since Denmark is clearly the major country. Per capita data are always important.	Partially Accepted. Lets just also note the leaders in % of annual supply terms, elsewhere in this paragraph. No need to include per capita, but % of generation does the trick, and we report that later in the body of the report anyway.
Rybach (Geowatt AG)	7	4	-	6	-	-	-	-	Capacity factors and costs need to be given.	Capacity factor and cost values have a large range based on geographic region, wind resource, and other factors. We prefer not to include these numbers in the Executive Summary, but there is a detailed discussion in the main text.
Rybach (Geowatt AG)	7	4	31	-	-	-	-	-	here is another argument against keeping wind development constant over the years in Table 1.2!	We do not keep wind development constant in Table 1.2, we keep the technical potential for wind constant. Though we agree that technical potential will change, we do not know in what direction over time, and we simply do not have the literature available to present figures that change over time as we must base our assessment on published literature.
Holtinen (VTT Technical Research Center of Finland)	7	4	6	4	8	-	-	-	It should be stated (also) here that in nearly all countries wind power needs subsidies (this is well written at the end). Congratulations for very well written exec summary!	Yes, we will clean up this and related text elsewhere.

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Allal (Observatoire Méditerranéen de l'Energie (OME))	7	4	27	-	-	-	-	-	<p>It is worth highlighting in the executive summary and in the chapter that barriers still do exist for large scale deployment of wind energy in some countries endowed with very high potential of wind, such as in the South Mediterranean countries.</p> <p>The most important are:</p> <ul style="list-style-type: none"> o the lack of resource data (very often data are not public or easily available. A number of country specific data sets are available but they are sometimes confidential or undisclosed) , o technical barriers (Wind power technology is mature and is in that sense well known to national stakeholders and widely Accepted as a reliable alternative to conventional electricity generation technologies. But since wind is a variable energy source, and it is rather difficult to predict its variation, care has to be taken when integrating large wind farms in existing electric power grids in order to avoid grid failures. Also, it was observed that grids are generally weak in target regions, which could hinder development of wind power if the grid is not improved. And in case of small remote grids, electricity storage solutions could also be considered, even though such technologies remain expensive at the time of writing. In conclusion, if no particular conditions are set regarding large-scale integration of wind power in countries with a low penetration of such technology, wind power development could be hindered by issues with grid management, grid instability and even grid failure.) o and financial and political barriers, developed in chapter 11 <p>See results of the EC 6th FP funded project REMAP project. www.remap-ec.eu</p>	Agreed that broader statements of this nature need to be added, though not focused on any one region
Twidell (AMSET Centre)	7	4	46	-	-	-	-	-	The dispersed and relatively small scale modular characteristics of wind power has advantages over central large scale generation for aspects of supply security and grid reinforcement.	Perhaps we can simply include some text indicating that ability to integrate depends in part in diversity of wind regimes and interconnections, and therefore ability to smooth ramps through geographic dispersion;
Driesen (K.U.Leuven)	7	4	-	6	-	-	-	-	The exec. summary should mention the prospects of small building-integrated wind power systems (wind harvesters)	Building-integrated wind turbines generally experience low wind speeds; this technology is not going to provide substantial near-term carbon mitigation potential. Therefore it is not suitable for mention in the Executive Summary; building-integrated wind will be mentioned in the textbox 7.1.
Allal (Observatoire Méditerranéen de l'Energie (OME))	7	4	15	-	-	-	-	-	<p>Total investments in wind installations equalled 13 billion Euros in Europe in 2009, 11.5 of which in offshore projects</p> <p>Update figures for Europe are available for 2009</p> <p>23% increase of installed capacity,</p> <p>Spain leader in additional capacities in 2009 (in Europe) with 2459 MW representing an annual growth of 24%, followed by Germany (+1917 MW and 19% annual growth).</p> <p>In 2009, wind energy represented 4.9% of total electricity generation in Europe.</p>	All data will be updated through 2009, where possible

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	4	36	4	36	Executive summary	-	-	A mention to the possible production of hydrogen should be added	Hydrogen is a storage technology. It is not a near-term integration issue, and therefore has generally been considered in the purview of the integration chapter. Hydrogen production by electricity could be accomplished from a variety sources, not just wind technology. It should not be mentioned in the Executive Summary.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	4	2	4	10	Executive summary	-	-	The paragraph is a little bit confusing. Sentences are not well connected and need, at least, to be reordered	We will review the text, and edit as needed. We will follow the new TSU guidelines for executive summaries.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	4	32	4	32	Executive summary	-	-	There is an inconsistency between what is stated here about wind potential in most regions and what is stated in lines 4 and 5 above. The same inconsistency also occurs in other sections. It should be stated clearly how wind potential is distributed around the planet.	We will review and edit the text accordingly.
Kiviluoma (VTT Technical Research Centre of Finland)	7	5	8	-	-	-	-	-	""electrical"" --> ""energy"" (Also heat storages and other electricity end-use storages can help wind integration)"	Accepted
Veers (Sandia National Laboratories)	7	5	36	-	-	-	-	-	""longer turbine life"" Turbine life with appropriate maintenance already appears to be sufficiently long - machines built over 20 years ago are still producing energy. The real issue is limiting the number of component failures and replacements over that lifespan. "	We will refer to longer component life rather than longer turbine life.
Gagnon (Hydro-Quebec)	7	5	32	-	-	-	-	-	"...more-rapid growth """, including proactive regulatory frameworks development from local authorities.""	We do not have the room to address the location for where the streamlining must come. In some instances, federal law governs, and in others local governments must be addressed. In many countries, one must address the national, regional, and local. We will try to make this more clear in section 6, but are not inclined to change the text in the ES
Gagnon (Hydro-Quebec)	7	5	19	-	-	-	-	-	"...up to 100 metres high ""at their hub"" □"	May affect section 6 as well
Twidell (AMSET Centre)	7	5	44	-	-	-	-	-	".significant carbon emission reduction□[take care; forestall criticism. Need to consider exactly what electricity generation is abated by wind and what are the implications for back-up. Much more detail must be mentioned and referenced.]"	These issues are all covered in the chapter to some degree, and are mentioned briefly in the ES in the environmental and social issues discussion. We do not feel that we have the space to provide more detail on these topics in the ES. However, we will add additional material in Section 7.6.1.3 to suggest that degradation of emissions benefits may increase with penetration, depending on how the electricity system changes with increased wind penetration.
Twidell (AMSET Centre)	7	5	7	-	8	-	-	-	"; increased and improved proactive demand management, e.g. switchable loads, and storage technologies WILL also be important."	Partially Accepted. We will alter the terminology, but may not use the term "WILL" as these technologies are not critical at low to modest penetration.

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Veers (Sandia National Laboratories)	7	5	18	-	-	-	-	-	"Define ""flicker""	May just get rid of term here as it is not critical and may not be worth defining and taking up the space.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	5	20	-	-	-	-	-	"replace ""arouses"" with ""arises""	Proposed word is incorrect, but we can use "creates"
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	5	3	-	-	-	-	-	"replace ""As wind energy increases"" with ""As wind energy penetration increases""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	5	24	-	-	-	-	-	"replace ""can"" with ""may""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	5	8	-	-	-	-	-	"replace ""demand"" with ""demand-side""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	5	6	-	-	-	-	-	"replace ""flexible generation resources (natural"" with ""flexible power generation technologies (based on natural""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	5	10	-	-	-	-	-	"replace ""robust"" with ""significant""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	5	30	-	-	-	-	-	"replace ""wind"" with ""wind energy deployment""	Accepted
Vahrenholt (RWE Innogy GmbH)	7	5	6	-	-	-	-	-	(...) flexible generation resources (gas, hydropower) (□) RWEI Comment: Wrong - if hydropower run-of-river, nuclear is as flexible as gas!	We will use different terminology, "e.g., natural gas combustion turbines, and hydropower dams"
Twidell (AMSET Centre)	7	5	13	-	14	-	-	-	.. Energy generated, with embodied energy and carbon payback periods of 9 to 15 months, □	This is addressed in the chapter itself. To conserve space we are not inclined to bring the actual data up into the text here.
Twidell (AMSET Centre)	7	5	19	-	-	-	-	-	..large structures (nacelle heights ~ 100 m, top tip height ~ 140 m), so□	May affect section 6 as well
Twidell (AMSET Centre)	7	5	26	-	-	-	-	-	□.has a SMALL environmental footprint□ [common error is to use 'low' for magnitude, whereas it refers to altitude. This can be misleading for wind power, e.g. 'low wind speed' . This mistake is very common]	May affect section 6 as well
Twidell (AMSET Centre)	7	5	43	-	-	-	-	-	[cost reduction compared with what? More clarity needed. Too vague as is.]	We will note that costs are in relation to 2008 estimates as shown in the body of the report.
Philibert (International Energy Agency)	7	5	11	5	11	-	-	-	A major socio-environmental barrier to be flagged is that the public has not yet equated its carbon concerns with a socio-environmental cost - that of modified landscape. Relevant both to new wind plants and new transmission.	This statement is true. The more narrow aspect of wind turbine visibility and landscape concerns are, in our view, adequately addressed in our chapter as well as mentioned in the Executive Summary. The more general tradeoffs noted in the comment would need to be addressed in other chapters. Additional research on the external cost of landscape changes is insufficient to provide the comparison requested. We will, however, note that similar issues exist for transmission, and will mention this in the chapter text.

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Kiviluoma (VTT Technical Research Centre of Finland)	7	5	42	-	-	-	-	-	Compared to what base level? 2008 or 2002? The difference is very large due to recent price hikes.	Accepted
Dunn (GE Energy)	7	5	5	5	8	-	-	-	Geographic diversification and larger balancing areas might also deserve mention as active management.	Accepted
Sawyer (Global Wind Energy Council)	7	5	41	5	43	-	-	-	Needs a reference	We do not include citations in the ES, but the body of the chapter clearly provides the citations for these figures.
Philibert (International Energy Agency)	7	5	18	5	30	-	-	-	No mention of public opposition to new transmission infrastructure as opposed wind plants themselves. New transmission corridors in Europe have been known to take 15 years to construct, mainly due to public opposition.	We will include discussion of this point at a minimum in the body of the report and, considering space constraints, will consider it for the executive summary. We will highlight not just public opposition, but also institutional constraints (e.g., adverse incentives among various players) to new transmission. We will also note that those transmission constraints are not unique to wind per se.
Kiviluoma (VTT Technical Research Centre of Finland)	7	5	22	-	-	-	-	-	□planning stage is□ --> □planning stage should be□	Accepted
Rabl (Vision & Results)	7	5	40	-	43	-	-	-	This is a discussion of reduction in levelized cost of wind, but the Executive Summary doesn't appear to include a baseline value, i.e., the cost prior to reduction.	Given the challenge of reporting detailed cost ranges in the executive summary, we prefer to leave that nuanced discussion to the body of the chapter. The chapter itself does provide the necessary detail to understand the content of the executive summary. We will make it clear what base year is being used in the calculation, and will consider more text on cost in the ES as space allows.
Dunn (GE Energy)	7	5	1	5	3	-	-	-	This language might need massaging, e.g. there are no technical barriers and economic costs are manageable. Also, can we quantify low to medium penetration levels? 10-20%?	We understand that there are technical barriers. We define low-to medium penetration levels as 10% - 20% wind generation. We will consider re-wording. Many studies, as well as practical experience, show that low to medium wind penetration levels, up to 20% wind energy, can be managed at a cost
Rosinski (Electric Power Research Institute)	7	5	13	5	14	Exec Summ	-	-	"Delete commas and change ""is"" to ""are in following sentence, ""The energy used, and emissions produced, in the manufacture and installation of wind turbines is small□.."""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	5	13	5	14	Executi ve summa ry	-	-	"For better clarity please remove commas around ""and emissions produced"", and change the verb is for are."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	5	28	5	28	Executi ve summa ry	-	-	"Please, add ""and should"" after ""could"" "	"should" is a value judgement. While the chapter authors agree in this regard, we do not believe that IPCC documents ought to be dealing with "shoulds" on most occasions.

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Gagnon (Hydro-Quebec)	7	6	4	-	-	-	-	-	"...not only ""field leveling"" economic□ "	We are not able, in the wind chapter, to discuss externalities in any detail: these must be left for the integrative chapters. We shall change the text to "economic policies" so that we side-step the important (but impossible to address head on in the wind chapter) question of what "field leveling" means in economic terms. We will make similar changes in the body of the chapter.
Gagnon (Hydro-Quebec)	7	6	22	-	-	-	-	-	"...wind is ""roughly"" proportional□"	Statement as included is technically correct, as a theoretical construct. Of course, actual extraction of energy does not go up with cube of wind speed
Kheshgi (ExxonMobil Research and Engineering Company)	7	6	2	6	8	-	-	-	"'Could rise□ to 20%'. There is no indication of the range expected for wind□s share only the extreme scenario. Suggest stating the range of wind□s share in scenarios and not the extreme value. The next sentence could then begin with 'Achieving the high end of this range of global wind□' "	We will bring in some of the "median" scenarios from the potential deployment section to provide additional context. For example, we might add text on the 25th-75th range for the BAU scenarios to 2050. This may also entail some changes to the Potential Deployment section.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	6	47	-	-	-	-	-	"delete ""often"""	we do not wish to make absolute statements, as some projects have smaller and larger rotors than whatever range we provide here
Vahrenholt (RWE Innogy GmbH)	7	6	46	6	47	-	-	-	"IPCC: ""(□) tubular towers of 60-100 (□) meters in height, (□) rotors (□) 70-100 meters (□) in diameter"". RWEI comment: height 60-150 meters; diameter of rotor 60-130 meters."	will affect other chapters as well
Vahrenholt (RWE Innogy GmbH)	7	6	1	6	3	-	-	-	"IPCC: ""(□) wind energy□s to global electricity supply could rise from 1.5% at the end of 2008 to 20% or greater by 2050 (□)"" RWEI comment: Where does the rest come from? "	This is a fine point, but cannot be something addressed in the wind energy chapter in much detail. Nonetheless, we should note in more detail in the integration section of the wind chapter that as wind penetration increases, there will be a tendency away from baseload and towards intermediate and peaking plants (as well as demand management). We do not believe that any further changes to the ES are needed on this point as this chapter is focused entirely on wind. The integrative chapters should address this point more generally.
Milborrow ((Sole proprietor)	7	6	46	-	-	-	-	-	"Query re towers could be resolved by saying, □""turbines MOSTLY stand on tubular towers"""	We will instead use the term "often", and also use language "as of 2009".
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	6	47	-	-	-	-	-	"replace ""70-100"" with ""60-100"" "	will affect other chapters as well
Treber (Germanwatch)	7	6	46	6	47	-	-	-	"turbines lager than 70 to 100 metres are not only ""under development"", but do operate in a number of onshore windfarms (e.g. 11 Enercon E-126 in Belgium) and offshore windfarms (e.g. 6 Repower 5M and 6 Multibrid in Germany)"	will affect other chapters as well
Gagnon (Hydro-Quebec)	7	6	38	-	-	-	-	-	Poul LaCour (not Paul La Cour)	We will check spelling

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Treber (Germanwatch)	7	6	46	-	-	-	-	-	Such turbines typically stand on tubular towers of 60-140 (!) meters rather than 60 to 100 metres	will affect other chapters as well
Veers (Sandia National Laboratories)	7	6	46	6	47	-	-	-	Turbine sizes are dated and may be out of date by the publication date.	we will use 50-100m diameter, and also indicate that "larger machines up to 130 m rotor diameter are operating, and 130 tower height"; tower height, 50-100 m
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	6	14	6	14	Introdu	-	-	""wind speed vary□"" should read ""average wind speeds vary□"" or ""wind resources vary□""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	6	17	6	17	Introdu	-	-	"Please, add ""of the air mass"" after ""kinetic energy""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	6	10	6	10	Introdu	-	-	"Please, remove ""global and regional"" because it does not apply to GHG emissions in this context. "	Let's just say GHG emissions without noting location
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	6	15	6	15	Introdu	-	-	"Please, remove the word ""substantial"" before ""regions""."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	6	44	6	45	Introdu	-	-	"The comment introduce the wording ""wind energy projects"" to refer to wind farms or wind parks or wind turbines. These last three options should be used in the text because the word ""project"" conveys the idea of a process that includes other aspects that are not physically tangible. I strongly believe that the use of ""wind projects"" instead of wind farms or wind parks or wind turbines is confusing all along this chapter 7."	Others like plants over farms and projects. We need to be consistent, and we will seek to be consistent in the use of "wind energy" and "wind power plant".
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	6	17	6	21	Introdu	-	-	"The lines starting with ""□the main□"" in line 17 up to the period in line 21 is too much detailed for an Introduction"	We will revise the text somewhat to simplify the presentation, while still maintaining some information on the basic physical processes involved.
Abed (National Research Center)	7	6	46						add:"towers of 60-100 m according to the turbine diameter"	Exact recommended text will not be used, but as per other comments, we will alter this text to change and clarify the range that we provide
Rosinski (Electric Power Research Institute)	7	7	14	7	14	7.1	-	-	"Delete and add commas as shown in ""...are also under consideration and, in addition to electricity generation, wind will continue to meet□""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	7	29	-	-	-	-	-	"replace ""Section 7.8"" with ""Section 7.9""	Accepted
Nielsen (Statoil)	7	7	4	-	-	-	-	-	In 2009 the first full size (2.3 MW) floating offshore wind turbine (Hywind) was installed at the west coasts of Norway at 220m water depth, see http://www.statoil.com/en/TechnologyInnovation/NewEnergy/RenewablePowerProduction/Offshore/Hywind/Pages/HywindPuttingWindPowerToTheTest.aspx	This will not be noted here, as it is not really appropriate for a the introduction, but we should include something on this later in the chapter.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	7	18	7	18	Introdu	-	-	"Please, change the word ""size"" for ""scale""	may impact chapter text as well
Abed (National Research Center)	7	7	5						add:" (ch.7)" after chapter	Accepted

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Name (Institute)	Chapter	From page	From line	To page	To line	Section	Figure	Table Info	Comments	Consideration by the writing team
Kruger (South African Weather Service)	7	8	1	8	1	7.1	-	-	"Change title of text box to ""Other wind energy applications and technologies other than large scale projects""."	We will alter text somewhat so that purpose of text box is clear, but will not use "other than large scale projects" language as that is incorrect
Twidell (AMSET Centre)	7	8	-	-	-	-	-	-	Text box 7.1. Small wind turbines [Throughout this text, change 'can' to 'are'. Hundreds of thousands of small wind turbines now operate successfully. It is an actuality, not a possibility]	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	8	-	-	-	Text Box	-	-	"the paragraphs on ""propulsion"" and ""high altitude wind electricity"" are out of scope and can be deleted"	We disagree. Though these may not now be major uses of wind energy, we do not believe that they are out of scope. The scope is the possible use of wind to reduce carbon emissions, so even less mature technologies deserve mention. We do not devote much space to these technologies, but we do believe they deserve inclusion.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	8	-	-	-	Text Box	-	-	the parenthesis referring to 500-1000 kW wind turbines is irrelevant and can be deleted	This text will be deleted, including parentheses.
Milborrow ((Sole proprietor))	7	8	-	-	-	Text box 7.1	-	-	"(2) base stations that ""convert the kinetic energy from the wind collected via kites at altitudes of about 1000 m"" How is this done?"	we will clarify the concepts further
Rosinski (Electric Power Research Institute)	7	8	1	8	1	Text box 7.1	-	-	"Third paragraph, last sentence; suggest splitting sentence in two to read ""...demonstration projects on mid-sized vessels. Studies have found that these systems may yield fuel savings of 10-50%, depending on the technology and wind conditions□"""	Accepted
Milborrow ((Sole proprietor))	7	8	-	-	-	Text box 7.1	-	-	Given that there are other unconventional ideas and concepts, AND space needs to be saved, might the last paragraph be omitted?	We disagree. Though this may not now be a commercial technology, we do believe a short paragraph is appropriate. The scope of our work is the possible use of wind to reduce carbon emissions, so even less mature technologies deserve mention. We do not devote much space to these technologies, but we do believe they deserve inclusion. We would be open to mentioning other innovative concepts as well, but are not aware of others that deserve inclusion at this time.
Veers (Sandia National Laboratories)	7	8	-	-	-	Text Box 7.1	-	-	It is the cost of high altitude wind that will be the most significant determinant of its application.	We cannot report realistic expectations for future costs of high altitude wind, but we should note the possibility of a cost barrier, as well as technical barriers, in the text box.
Veers (Sandia National Laboratories)	7	8	-	-	-	Text Box 7.1	-	-	kChange to □may limit the production, transportation, installation and maintenance of larger turbines).	Accepted
Abed (National Research Center)	7	8	15	8	24				L.15 and L24.24 contradiction?	We will clarify this point, which is a difference between cumulative and annual installations

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	9	2	9	5	7.2	-	-	"Perhaps a footnote explaining the concepts ""global exploitable"" (line 2) and ""technically exploitable"" (line 5) would be very useful. This comment applies for the whole report. "	We will try to add something, and we will try to be consistent, and not use "global explotable wind resource" language. We need the word "technical" before all statements of resource potential, and we should note that technical potential is a matter of subjectivity. Will need to be addressed throughout report as well.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	9	6	9	6	7.2	-	-	"Please, replace the word ""most"" for ""many"" before ""regions"""	In the IPCC process, a region is defined, as per IEA economic regions, of which there are seven. With this broad definition, we believe that the terminology "most" is appropriate. We will consistently use "regions of the world" to make it clear that we mean larger regional areas.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	9	9	9	9	7.2	-	-	"Please, replace the word ""size"" for ""scale"""	may impact chapter text as well
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	9	9	9	9	7.2	-	-	"Please, replace the word ""size"" for ""scale"""	may impact chapter text as well
Gagnon (Hydro-Quebec)	7	9	18	-	-	-	-	-	"...prediction models ""or computational fluid dynamics (CFD) models""□"	current terminology is correct, but we will try to clarify the meaning.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	9	25	-	26	-	-	-	delete these two lines. Their content has already been discussed a couple of times	Accepted
Zhu (China Meteorological Administration)	7	9	16	10	19	-	-	-	Except for analysis based on meteorological observations, another method for global wind energy resource assessment is based on reanalysis data set from ECMWF, NCEP, GEOS-5, etc.	Though we do not mention the ReAnalysis dataset, we do note the two methods in use, one of which is to use numerical weather prediction models. ReAnalysis uses a combination of the two methods, so is mentioned implicitly already. It is also only one of many possible similar datasets, and we do not have the room to discuss all of them.
Paredes (Inter-American Development Bank)	7	9	27	9	33	-	-	-	It is said that the on-shore wind energy potential□s estimate by the IPCC is 600EJ first and later 180EJ, but the difference between these two figures is not clear from the text.	Footnote 2 clearly indicates why the discrepancy exists. The Introduction to the report will also discuss these conversions in detail.
MANNEH (MINISTRY OF FINANCE AND ECONOMIC AFFAIRS)	7	9	15	22	33	-	-	-	The Chapter could be shortened from these areas without affecting the substance	We will seek to shorten the text in this area, and in others
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	9	26	9	26	7.2.1	-	-	"Add the word ""current"" before ""total global electricity supply"""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	9	14	9	14	7.2.1	-	-	"Add the word ""wind"" before ""resource potential"""	This is the wind energy chapter, so it should be clear that we are discussing wind. In addition, these subsections have been locked down by the IPCC, and cannot be readily changed or inconsistency with other technology chapters will ensue

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Sawyer (Global Wind Energy Council)	7	10	-	-	-	-	-	7.1	"Hoogwick and Graus Citation: values appear to be the wrong way around between onshore and offshore costs"<0.18\$/KWh for onshore and <0.09/KWh for offshore""	We also are unclear on this, and will check the original study for accuracy; however, we believe these are accurate
Rosinski (Electric Power Research Institute)	7	10	-	10	-	-	-	7.1	"In 2nd row, not clear why tech potential offshore wind cost is lower than onshore wind cost in this sentence: ""technical potential defined here in economic terms: <\$0.18/kWh (2005\$) that of on-shore wind and<\$0.09/kWh (2005\$) for off-shore wind in 2050"" "	We also are unclear on this, and will check the original study for accuracy; however, we believe these are accurate
Zhu (China Meteorological Administration)	7	10	-	11	-	-	-	7.1	Please list the detail data base and resolution in the column of methods and assumptions. Because it has a close bearing on the reliability of the assessment.	We can no readily add those details, as the studies themelves are not so clear on this point. We offer the citations, and the interested reader can review those studies for additional detail.
Veers (Sandia National Laboratories)	7	10	-	-	-	-	-	7.1	Since they are used repeatedly, the terms Technical, Theoretical, Economic, and Sustainable potential need to be clearly defined	This is an excellent point, but this needs to be defined earlier in the overall IPCC document, not in the wind energy chapter. At the bottom of the table, however, we will add a note that defines these terms in a very loose way, or will otherwise point to the glossary.
Bonduelle (EE Consultant)	7	10	-	-	-	-	-	7,2,1	Capacity factor for Archer (2005) seems rather high (48% !)	That may be true, but we are simply reporting the literature, and offer no judgement of the accuracy of any individual assessment. The basic message of the text is clear, though it is true that one might quibble with the details of some of the individual studies.
Zhu (China Meteorological Administration)	7	11	15	12	20	-	-	-	The expression is not very clear. The paragraph may be want to say that along with the wind technology developing, higher capacity and hub of wind turbine led to more technical potential of wind energy.	Accepted
Rosinski (Electric Power Research Institute)	7	11	24	11	24	7.2.1	-	-	"Change ""constrain"" to ""limit"" in sentence ""...grid interconnection may constrain development to relatively near-shore locations□""	Accepted
Rosinski (Electric Power Research Institute)	7	11	34	11	34	7.2.1	-	-	"Change end of this line to read ""...(2009) estimate an off-shore wind resource potential of 150,000 TWh/yr, of which 42,000 TWh/yr□""	Accepted
Pinho (Institut of Tecnology)	7	12	-	-	-	-	-	7.1	It is difficult to see the legends of the figure.	Accepted
Zhu (China Meteorological Administration)	7	12	4	13	18	-	-	-	Please give the further explanation on how the method of assessment developed and why more wind energy potential is found out.	The key point is that computing power has allowed higher resolution modeling, combined with better measurements. We will try to say more clearly that finer-resolution, better modeling is allowing us to see better the real wind resource given the finer resolution now available. Additionally, improved validation enabled through comparisons between measurements and models have played an important role.
Rosinski (Electric Power Research Institute)	7	12	3	12	3	7.2.1	-	-	"Delete comma from this line ""...off-shore wind resource is significant, and highly dependent on assumed technology developments□""	Accepted
Rosinski (Electric Power Research Institute)	7	12	16	12	16	7.2.1	-	-	"Delete comma in ""...wind resource potential, and to an improved understanding of the location of that potential.""	Accepted

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Rosinski (Electric Power Research Institute)	7	12	10	12	10	7.2.1	-	-	"Delete commas in "...approaches are beginning to be applied (and, increasingly, validated) on a country or regional basis..."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	12	24	12	24	7.2.1	-	-	"I suggest using ""impacts might restrict growth"" instead of ""are likely""	This is largely editorial, but the absolute scale of the wind resource is sizable enough that we believe that it is likely that these other variables will constrain growth before resource limits are reached. As such, we believe that the current text, which is somewhat stronger, is more accurate than the lighter "might" suggested here. Note to authors: consider the use of the work 'likely' in the context of the IPCC definitions of probabilities.
Zhu (China Meteorological Administration)	7	12	-	15	-	7.2.2	-	-	After the investigation of literature, a distribution of global wind power potential should be made out by author, and then gives a description of climatic zoning of global wind energy resources.	As an IPCC document we are not allowed to conduct new analysis: we are restricted to reporting on the available literature. As such, though we currently report regional resource potential based on a number of studies, given limitations in those studies and IPCC restrictions, we are unable to provide the summary requested here.
Hegde (Suzlon Energy Ltd)	7	13	-	13	-	-	-	-	Another observation is that while there are details of the wind potential assessment region wise, there is no table that details the assessed wind potential in the major countries across the world. Further Class wise details would yield a better idea of the potential of wind region wise.	We simply do not have the space, or the data for that matter, to present country level wind resource data from the global wind resource literature. We do provide citations and links to many country level maps, but we do not have the space to offer the details here. In addition, given comparability differences in the literature, it would be misleading to try to present comparable country-level resource data based on numerous different sources.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	13	1	13	1	7.2.2	-	-	"Please, change the word ""most"" for ""many""	In the IPCC process, a region is defined, as per IEA economic regions, of which there are seven. With this broad definition, we believe that the terminology "most" is appropriate. We will consistently use "regions of the world" to make it clear that we mean larger regional areas.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	13	21	13	28	7.2.2	-	-	This analysis could be misleading, since the energy consumption growth rate (that is not considered here) is different for different regions and countries as well as the per capita consumption patterns.	A good comment, but we can do little to resolve the issue, as we must report what is available in the literature. We will endeavor to offer a footnote making this point as long as we can do so without excessive use of verbiage.
Twidell (AMSET Centre)	7	14	12	-	-	-	-	-	..WITH urban or built environments nearby. [many met stations are in non-urban areas, but may have buildings near, e.g. airfields that have developed over time]	Accepted
Paredes (Inter-American Development Bank)	7	14	28	14	28	-	-	-	Footnote 9: which is the table being referred to?	Accepted

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	14	5	14	5	7.2.2	-	-	"The statement □"virtually every region□" is contradictory with previous statements on the subject. Please, let us be consistent on this issue of regions and wind resource potential. "	We will try to be cleaner with these statements. In many cases, confusion relates to varied interpretations of the word "region"
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	14	6	14	6	7.2.2	-	-	"What is said in the sentence starting at the end of this line, is not ""as a result□" of the previous sentence. "	Accepted
Rosinski (Electric Power Research Institute)	7	14	15	14	15	7.2.2.2	-	-	"Change ""is"" to ""are"" in ""...measurement data is of limited quantity and quality.""	Accepted
Rosinski (Electric Power Research Institute)	7	14	20	14	20	7.2.2.2	-	-	"Delete comma from ""...wind speeds, at a variety of possible turbine heights.""	Accepted
Rosinski (Electric Power Research Institute)	7	14	10	14	10	7.2.2.2	-	-	"Delete comma from this line ""...The global wind energy assessments described previously have, historically, relied primarily on 11""	Accepted
Rosinski (Electric Power Research Institute)	7	14	32	14	32	7.2.2.2	-	-	"Delete comma in ""...This is due primarily to improved data and analytic techniques, and greater resolution□""	will add an also instead
Rosinski (Electric Power Research Institute)	7	14	36	14	36	7.2.2.2	-	-	"Delete commas in ""...resolution, and enhanced validation of model results with observational data, are needed, as is an□""	will add an also instead
Allal (Observatoire M?diterran?en de l'Energie (OME))	7	14	10	15	-	7.2.2.2	-	-	Regional assessment of wind resources was also made for the Mediterranean region (Southern and Eastern Mediterranean countries) with support of the European Commission (DG Research) within the 5th and 6th FP and through several projects: INTERSUDMED, IRESMED, MED2010 and REMAP (see www.ome.org). More details of wind assessment in the Mediterranean region are offered in the following figures: (see houda_allal_picture_1.gif) Average wind speed in the Mediterranean Basin in m/s from the NASA SSE data set in the years 1983-1993. (see houda_allal_picture_2.gif) Average wind speed in the Mediterranean Basin in m/s from the Reanalysis data set in the years 1979-1993.	Accepted
Nielsen (Statoil)	7	16	-	-	-	-	7.2	-	In discussion of resource assement there is a mix of GW and TWh/year. Be consistent in use of units.	Accepted
Renne (National Renewable Energy Laboratory)	7	16	-	-	-	-	7.2	-	It is difficult to draw comaprison with these two approaches: one calculates wind energy potential in terms of power (GW), while the other is in energy (TW-hr). Also, one uses units of power, which is more appropriate than wind speed.	We will seek to report that data on a common basis, if the literature allows us to. The purpose of the box is to discuss methodological improvements over time, however, so comparabilty in the numbers between russia and china are not essential.
Nielsen (Statoil)	7	16	-	-	-	-	7.2	-	Reference is made to Figure 7.2.2. This does not exist.	Accepted
Pinho (Institut of Tecnology)	7	16	-	-	-	-	7.2	-	Same as for figure 7.1.	We will try to present figures with better legends that are readable
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	16	-	16	-	7.2.2	Text Box 7.2	-	In this Text Box there are references to Figure 7.2.2., but the figure in the Text Box is 7.2 (a,b)	Accepted
Zhu (China Meteorological Administration)	7	16	-	16	-	Tex box	-	7.2	In December 2009, China Meteorological Administration released new result of wind energy resource assessment for whole China, the wind power potential is about 8 time of the former. The new released results can be quoted here.	Excellent, we will include the latest information

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Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	16	-	-	-	Text Box	-	-	References to Figures 7.2.a and b need correction	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	16	-	-	-	Text Box	-	-	Should China's wind potential be given in GW (instead of GWh/yr) ? Could you convert with a proper capacity factor?	Pending data availability, we will do this
Rosinski (Electric Power Research Institute)	7	16	-	16	-	Text Box 7.2	-	-	"Third paragraph, line 6: Delete comma from ""Based on this work, and after making □""	Accepted
Pengfei (HYDROCHINA)	7	16	1	16	1	Text box 7.2.	-	-	China's Meteorological Administration (CMA) completed the new wind energy resource assessment by December 2009, please ask the author Zhenbin Yang to update the assessment results in China.	Excellent, we will include the latest information
Abed (National Research Center)	7	16	26	-	-	-	-	-	change 7.2.2 to 7.2.b	Accepted
Milborrow ((Sole proprietor))	7	17	37	-	-	-	-	-	""size has increased by a factor of 100"". Why not quote sizes? E.g. 10-15m in 1980 to 100 m today (factor of 100 seems high)"	Accepted
Milborrow ((Sole proprietor))	7	17	9	-	-	-	-	-	""than the inter-annual variability (i.e. 15%)"" Is this the standard deviation? If so, it seems high."	We will discuss with our LA and CA experts
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	17	46	-	-	-	-	-	"replace ""advancements"" with ""technology advancements""	Accepted
Twidell (AMSET Centre)	7	17	41	-	-	-	-	-	□commercial scale with bank financing that requires optimum standards of construction and operation.	These additional words do not seem necessary to make the point that we have already made here.
Veers (Sandia National Laboratories)	7	17	8	17	19	-	-	-	Interannual variability is not a good metric for comparison with long-term energy estimates since the first is a variance and the second is a bias and have a significantly different impact on the economic viability of wind plants.	We will discuss with our LA and CA experts
Sawyer (Global Wind Energy Council)	7	17	15	17	41	-	-	-	please recheck the source for inter-annual and inter-decadal variability. The inter-annual number seems a bit high but in the right range, where the inter-decadal one would normally be smaller.	we will check for accuracy
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	17	11	-	12	-	-	-	The conclusion - reference for Brasil is completely out of line from the rest conclusions. I propose to skip it if there are reasons to believe that it is wrong. Else, it should be thoroughly explained.	There is a new study on Brazil, cited above, that updates the earlier study. We will integrate the latest work as per Sara Pryor's recommendation.
Paredes (Inter-American Development Bank)	7	17	11	17	13	-	-	-	Which is the study that says the wind resource in Brazil will decrease up to 60%? The study from Roberto Schaeffer even found out that wind resource is to increase (The vulnerability of wind power to climate change in Brazil, Renewable Energy, 9 Nov. 2009). Even if an article says that the wind resource will tend to decrease, I doubt by so much as 60%!!!, it has to be put in context taking into account the large uncertainties in the GCM modelling, downscaling etc. Just a sentence as this one could be taken by the press literally, not being a true evidence.	There is a new study on Brazil, cited here, that updates the earlier study. We will integrate the latest work as per Sara Pryor's recommendation.
Rosinski (Electric Power Research Institute)	7	17	3	17	3	7.2.3	-	-	"Delete comma from ""...and/or the inter- and intra-annual variability of the wind resource, or alter the external conditions for □""	Accepted
Rosinski (Electric Power Research Institute)	7	17	20	17	20	7.2.3	-	-	"Delete comma from ""...design, as well as operation and maintenance □""	Accepted

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	17	3	17	3	7.2.3	-	-	"It is not clear what ""external conditions"" means in this context."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	17	15	17	18	7.2.3	-	-	Agree with TSU, the paragraph is not clear	we will clarify
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	17	1	17	1	7.2.3	-	-	Being this subject a key issue in this report from IPCC, this section deserve further elaboration.	This literature is still at an early phase, and in this section we summarize the literature in summary form, but still with reasonably strong coverage. Given uncertainty in the literature itself, we are hesitant to add considerable additional text. However, we will bring the conclusion in the ES on this issue to this section as well.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	17	7	17	9	7.2.3	-	-	The statement made in these lines is very important and deserve further elaboration.	We will see what we can do.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	17	39	17	39	7.3.1	-	-	"The word ""reasonably"" requires comparison to other technologies, otherwise is too vague."	We will come up with better language
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	17	35	17	35	7.3.1	-	-	"Wind turbines can be described as highly sophisticated, but not ""highly complicated", I would remove this adjective. "	Accepted
Twidell (AMSET Centre)	7	18	-	-	-	-	7.3	-	"Misleading to imply all turbines have constant rotor speed; variable speed machines are now the norm. At the least, add such a comment in the caption. N.B. page 19, line 16 etc gives this opinion, so the eye-catching figure should reinforce the point."	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	18	29	-	-	-	-	-	"replace ""(Figure"" with ""and producing extra aerodynamic noise and loading (Figure""	Accepted
Veers (Sandia National Laboratories)	7	18	5	-	-	-	-	-	"Replace ""wind speed"" with ""maximum power rating"" "	The original statement, which we also make in the introduction, is accurate, and therefore this comment should be Rejected
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	18	6	18	8	7.3.2	-	-	"I suggest to move down (right before the figure 7.3) the sentence starting with ""when the power□"" and ending with ""□see figure 7.3)""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	18	6	18	6	7.3.2	-	-	"I suggest to replace the word ""increase"" for ""energy"" and stop the sentence right there."	Blanco actually wants to move this section down a bit, which is a good idea
Rosinski (Electric Power Research Institute)	7	18	2	18	20	7.3.2	-	-	Paragraph doesn't mention the 59% Betz limit on energy that can be recovered from energy in the wind. Shouldn't it be mentioned here?	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	19	-	-	-	-	7.4	-	"Figure's legend : add at the end ""including horizontal and vertical axis machines""	Accepted

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Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	19	-	-	-	-	7.5	-	redundant, can be skipped (changing the legend of Figure 7.4 as suggested below)	We believe that it is useful to provide this figure, as well as the others, for readers who might be unfamiliar with the technology. We will look for a different figure that combines figures 7.5 and 7.6, and will consider eliminating the figure if we are not otherwise able to reduce space adequately.
Milborrow ((Sole proprietor))	7	19	7	-	-	-	-	-	""MOSTLY relied on aerodynamic stall"" ? Is this correct?"	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	19	19	-	-	-	-	-	"replace ""glass polyester or glass epoxy"" with ""composite materials""	Accepted
Driesen (K.U.Leuven)	7	19	-	20	-	-	-	-	Direct-drive wind turbine (without gearboxes) are not given attention although they represent a significant part of the market, esp. In larger powers	Accepted
Rosinski (Electric Power Research Institute)	7	19	13	19	13	7.3.2	-	-	"Delete comma from ""...the drive train caused by wind turbulence, and to allow more efficient operation in variable and□""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	20	7	-	-	-	-	-	"replace ""70-100"" with ""60-100"" "	need to be consistent with statements made elsewhere in chapter
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	20	13	-	-	-	-	-	"replace ""capacity"" with ""capacity), land use and visual impact for the same installed power""	This list of reasons is focused on economic consideration for increasing turbine size; land area and visual impact are not economic reasons and will not be mentioned here. We will try to clarify this point.
Bonduelle (EE Consultant)	7	20	4	20	18	-	-	-	A table or figure showing the share of large turbine (2-3 MW) in sales of suppliers would be useful here	We believe that the current presentation is sufficient to note the upscaling that has occurred over recent years, and we do not want to present data that will certainly become outdated very quickly.
Driesen (K.U.Leuven)	7	20	18	-	-	-	-	-	In 2008-2009, Enercon built several 7 MW wind turbines in Germany and Belgium on-shore	we will edit text as needed
Bonduelle (EE Consultant)	7	20	4	20	18	-	-	-	Recent evolution in size of wind turbines stems also from the need to exploit weaker winds (e.g. Germany), and not only by a quest for resource of a better quality.	Accepted
Milborrow ((Sole proprietor))	7	20	18	-	-	-	-	-	since there are now turbines rated at 6 MW, this sentence seems dated. Also conflicts with page 22, line 6	we will edit text as needed
Treber (Germanwatch)	7	20	18	-	-	-	-	-	Today, the biggest turbines installed onshore have an installed capacity of 7.5 MW (e.g. Enercon E-126)	we will edit text as needed
Rosinski (Electric Power Research Institute)	7	20	16	20	16	7.3.2	-	-	"Add comma in ""...impact of larger turbines on the visual quality of the landscape, especially in areas of high□""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	20	11	20	12	7.3.2.1	-	-	"The sentence between brackets ""(installation of□"" can be removed."	The statement helps clarify the point and is, we believe, useful, even if not essential.
Twidell (AMSET Centre)	7	21	6	-	-	-	-	-	".total of only 670 hours per year [do not compare hours per year with hours per 10 years; the reader will not spot the difference]"	Accepted

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Twidell (AMSET Centre)	7	21	3	-	-	-	-	-	"Add 'with mechanical availability of 98 to 99%'; 4,000 to 7,000 h is the time actually generating. CLARIFY"	We discuss availabilities already in the paragraph below this one, and to minimize duplication, we do not wish to discuss this point twice.
Philibert (International Energy Agecy)	7	21	39	21	39	-	-	-	"Is there sufficient evidence for ""NO noise constraints""? Much LESS (than onshore) certainly. But extent of potential noise impact on cetaceans has yet to be established."	Accepted
Veers (Sandia National Laboratories)	7	21	2	-	-	-	-	-	"Replace ""up to and even exceeding"" with ""over"""	Accepted
Hegde (Suzlon Energy Ltd)	7	21	32	-	32	-	-	-	Add Germany and mention new large projects in China	We will amend the text as needed. We are focused here on not every offshore project, but where most have been built so far. But we will alter the text somewhat.
Twidell (AMSET Centre)	7	21	13	-	-	-	-	-	Betz is a CRITERIA, not a theoretical limit of fundamental science. The reference should be to the LANCHESTER-BETZ criterion, since Lanchester (UK engineer) published the criterion before Betz for linear momentum theory (e.g. see Cuerva and Sanz-Andres 'The extended Betz-Lanchester limit', Renewable Energy vol 30, issue 5, pp783-794 and other more fundamental papers).	Maureen and Peter to get to the bottom of these historical facts
Hegde (Suzlon Energy Ltd)	7	21	38	-	38	-	-	-	Grid investments are a constraint even in offshore and even more costly to install. Emphasis required, either here or in chapter 8	We have made this point to some extent already, and footnote 10 covers it adequately in our view. However, we will add text to the footnote on the fact that transmission is more expensive offshore than onshore
Milborrow ((Sole proprietor))	7	21	10	-	12	-	-	-	the discussion of efficiency could perhaps note that peak efficiency is only achieved over a narrow range of wind speeds. The efficiency over the full range of wind speeds is lower.	Accepted
Sawyer (Global Wind Energy Council)	7	21	6	21	7	-	-	-	the hours for a car should be quoted per year and not per decade, i.e 666 hours	Accepted
Hegde (Suzlon Energy Ltd)	7	21	38	-	38	-	-	-	Transport requirements are even more complex in offshore. Emphasis required.	We will try to clarify the point
Twidell (AMSET Centre)	7	21	40	-	-	-	-	-	You may wish to add a recent reference book 'Offshore wind power', J. Twidell and G. Gaudios, Multi-Science UK, 2009, pp 357.	Maureen and Peter to consider this
Rosinski (Electric Power Research Institute)	7	21	19	21	19	7.3.2	-	-	"Change ""lower"" to ""reduce"" in ""...to improve reliability, increase electricity production, and lower costs are anticipated, and are□"""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	21	2	21	2	7.3.2.1	-	-	"As said before, please use wind farms, wind parks, wind turbines according to the context instead of ""wind projects"""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	21	7	21	7	7.3.2.1	-	-	"The word ""relative"" requires comparison to other technologies, otherwise is too vague."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	21	21	21	21	7.3.2.1	-	-	"The word ""relatively mature.."" requires comparison to other technologies, otherwise is too vague. Since this kind of wording appears several times in the text, we should be consistent all along. "	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	21	1	21	6	7.3.2.1	-	-	The second and third sentences in this paragraph are not related with the first sentence.	we will edit text as needed
Abed (National Research Center)	7	21	9						omit:" As.....technology". And start sentence with "Modern...."	Accepted

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Sawyer (Global Wind Energy Council)	7	22	1	22	2	-	-	-	"Average offshore turbine size was 3-5 MW between 2005-2008, with a maximum size of 6MW. (EWEA, 2010); Reference: European Wind Energy Association, 2010. The European offshore wind industry-key trends and statistics 2009. Brussels.http://www.ewea.org/fileadmin/emag/statistics/2009offshore/"	Accepted
Veers (Sandia National Laboratories)	7	22	47	-	-	-	-	-	"Missing ""and""	Accepted
Veers (Sandia National Laboratories)	7	22	20	-	-	-	-	-	"Replace ""greater aerodynamic efficiencies"" with ""lower torque and lighter drive train components for the same power output"". There is no change in aerodynamic efficiency, merely a movement in the set point for peak efficiency."	Accepted
Hegde (Suzlon Energy Ltd)	7	22	16	-	21	-	-	-	The differences between onshore and offshore can be listed pointwise rather than being put in a paragraph giving a clear comparative picture of the two.	The current text adequately describes the differences between offshore and onshore technology, given the available space to dedicate to this subject and given continued uncertainty on what the precise differences are among these technologies.
Bonduelle (EE Consultant)	7	22	1	-	-	-	-	-	This paragraph is a little outdated, because recent projects in 2008-2009 are base only on machines in the 3-5 MW range. There are no more 2 MW turbines in those projects.	Accepted
Rosinski (Electric Power Research Institute)	7	22	19	22	19	7.3.2	-	-	"Add comma as in ""...concerns about noise are reduced for off-shore projects and higher tip speeds can sometimes lead to□""	Accepted
Rosinski (Electric Power Research Institute)	7	22	44	22	44	7.3.2	-	-	"Change ""has"" to ""Have"" in ""...resource potential, has created considerable interest in off-shore wind technology in the E.U.; that□""	Accepted
Rosinski (Electric Power Research Institute)	7	22	31	22	31	7.3.2	-	-	"Change comma to semicolon to read ""...impossible at times; and jobs that require off-shore cranes can involve considerable delays while□"" "	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	22	45	22	45	7.3.3	-	-	"Please, use ""wind farms"" instead of ""wind projects""	We will not use the terminology wind farms; however, we will try to standardize on one term, perhaps wind power plant
Gagnon (Hydro-Quebec)	7	23	21	-	-	-	-	-	"...minimum ""interconnection"" requirements□"	Accepted
Rosinski (Electric Power Research Institute)	7	23	-	23	-	7.3.3	7.8a&b	-	"It's difficult to read what's in the boxes; suggest removing the background in the boxes."	Accepted
Rosinski (Electric Power Research Institute)	7	23	15	23	16	7.3.4	-	-	"Change ""installations to ""installed capacity"" in: ""...As wind turbine installations have increased,□""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	23	15	23	15	7.3.4	-	-	The first sentence is too negative to start a section, specially in view of the rest of the content of the section.	We will review the text and consider changes, noting that one review editor does not agree with this comment.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	24	28	24	28	7.4	-	-	"I suggest to add ""further"" before ""demonstrates""."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	24	30	24	30	7.4	-	-	"I suggest to move down the part of the sentence ""off shore wind energy is developing slowly""	This text will be edited based on other comments as well.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	24	24	24	24	7.4	-	-	"The word ""relative"" requires comparison to other technologies, otherwise is too vague."	Accepted
Gagnon (Hydro-Quebec)	7	24	13	-	-	-	-	-	""some"" fault ride-through□"	Accepted

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Gagnon (Hydro-Quebec)	7	24	41	-	-	-	-	-	"...than 27 GW in ""record year"" 2008,..."	Accepted
Sawyer (Global Wind Energy Council)	7	24	41	24	42	-	-	-	"Change the sentence from 'more than' into '37GW in 2009, up from 27GW in 2008 and 20 GW in 2007' ; Change the reference into (GWEC, 2010) Reference: GWEC 2010. Global wind power boom continues despite economic woes. Brussels. http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=247&tx_ttnews[backPid]=97&cHash=8a55b8eab5 "	Accepted
Gagnon (Hydro-Quebec)	7	24	36	24	37	-	-	-	"Repetition. ""From 1998 through 2008, the average annual increase in cumulative installed capacity was 29%. "" should be deleted."	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	24	33	-	-	-	-	-	"replace ""under-represented"" with ""under-exploited"""	Same resolution as noted earlier
Rabl (Vision & Results)	7	24	42	-	43	-	-	-	"There was no reduction in the US wind growth rate in 2009; the data should be updated."	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	24	28	-	33	-	-	-	"This conclusional part of the introduction is contradictory to the beginning of Section 7.4.1 (words like ""limited"", ""just"" etc create this impression to the reader) I propose to skip it and integrate (if needed) relevant text in Section 7.4.4 "	We find the current text to be an accurate summary of the section that follows, and we are trying to offer such summaries in the introductory paragraphs of each section. Language throughout the chapter will be modified to reduce the use of words like "maturity" and "cost-effective". We will consider the specified text to minimize contradiction; the word "just" will be deleted.
Gagnon (Hydro-Quebec)	7	24	40	-	-	-	-	-	"Unclear. ""In another [TSU: wording unclear] record year for new installations, "" should be deleted."	Accepted
Hegde (Suzlon Energy Ltd)	7	24	-	25	-	-	-	-	2009 installation data has already been released. We have attached the press release based on which the nos. could be updated.	Accepted
Sawyer (Global Wind Energy Council)	7	24	42	24	43	-	-	-	Despite the Financial crisis and economic downturn, the wind power, the market experienced tremendous growth in 2009, with another record breaking annual growth of 31%. See http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=247&tx_ttnews[backPid]=4&cHash=1196e940a0	Accepted
Sawyer (Global Wind Energy Council)	7	24	38	24	40	-	-	-	From 1998 to 2009, the global wind installed capacity grew from 10GW to 158GW, with an average annual increase in cumulative installed capacity of over 30%. Reference: GWEC 2010. Global wind power boom continues despite economic woes. Brussels. http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=247&tx_ttnews[backPid]=97&cHash=8a55b8eab5	Accepted
Jara Tirapegui (Endesa Eco S.A.)	7	24	42	-	-	-	-	-	The sentence is now out of date, because it refers to a forecast about the growth in wind power capacity in 2009.	Accepted
Paredes (Inter-American Development Bank)	7	24	36	24	37	-	-	-	The sentence of average annual increase is repeated afterwards, in lines 39-40.	Accepted
Milborrow ((Sole proprietor))	7	24	9	-	-	-	-	-	There are still lots of machines with induction generators. It is new machines that have other types.	Accepted
Rosinski (Electric Power Research Institute)	7	24	6	24	6	7.3.4	-	-	"Divide into two sentences and change second part sentence to ""There are three broad configurations of large grid-connected turbines."""	Accepted

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	24	5	24	21	7.3.4	-	-	This paragraph needs further explanation or to be moved to section 7.5	We will change the title of this section to "Power Conversion and Related Grid Connection Issues", and will focus entirely on such issues (turbine side). The text will be revised for clarity, and some portion of the final paragraph will be moved to section 7.5 - which focuses on the electric system and benefits.
Rosinski (Electric Power Research Institute)	7	24	38	24	38	7.4.1	-	-	"Add comma after ""1998"" in ""...cumulative capacity of 10 GW in 1998 the global installed capacity□""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	24	35	24	40	7.4.1	-	-	This was already said earlier	Delete this sentence.
Abed (National Research Center)	7	24	40						omit:"In another.....installations"	Accepted
Twidell (AMSET Centre)	7	25	-	-	-	-	7.9	-	Add 009 data, and alo extrapolate to, say, 2015. Extrapolations are useful, since the report will otherwise seem to date.	We discuss potential deployment scenarios later in the chapter, whereas this section is focused only on historical developments. We will add 2009 data.
Sawyer (Global Wind Energy Council)	7	25	3	25	5	-	-	-	"About 2056MW of off-shore wind turbines have been installed by the end of 2009, primarily in European waters, with plans for a further 1-2 GW of offshore wind installation by 2010. EWEC, 2010) Reference: European Wind Energy Association, 2010. The European offshore wind industry-key trends and statistics 2009. Brussels. http://www.ewea.org/fileadmin/emag/statistics/2009offshore/ "	Accepted
Veers (Sandia National Laboratories)	7	25	21	-	-	-	-	-	"add ""and India"" to the location of wind development in the 1990s."	Accepted
Sawyer (Global Wind Energy Council)	7	25	12	25	13	-	-	-	"By the end of the sentence, add ""by the end of 2008""	Accepted
Sawyer (Global Wind Energy Council)	7	25	9	-	-	-	-	-	"Change ""US \$ 45billion"" into ""US \$50billion""	We will update with 2009 data
Veers (Sandia National Laboratories)	7	25	7	-	-	-	-	-	"Change to ""constrained by local resource availability"" or it will be inconsistent with previous arguments. "	Accepted
Sawyer (Global Wind Energy Council)	7	25	18	25	19	-	-	-	"update the 2009 figure: change line 18 as ""end of 2009"" change USA 35GW, Germany 26GW, China25GW, Spain (19GW)and India (11GW) (GWEC, 2010) Reference: GWEC 2010. Global wind power boom continues despite economic woes. Brussels. http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=247&tx_ttnews[backPid]=97&cHash=8a55b8eab5 "	Accepted
Twidell (AMSET Centre)	7	25	16	-	-	-	-	-	Add at end. 'Continuing exponential increase of global wind power means that wind generation in 2025 could be [20%] of electricity supplied'.	We discuss potential deployment scenarios later in the chapter, whereas this section is focused only on historical developments
Twidell (AMSET Centre)	7	25	19	-	20	-	-	-	Add 'Per capita statistics are revealing also, with Denmark having the largest per capita capacity at 650 W/person, followed by Spain and Germany at about 350 W/person'	We already provide % of electricity supply figures, which are close to per capita figures, and that seems sufficient in order to present the data in multiple days. In addition, electricity supply is more meaningful than MW/capita in our view.

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Dunn (GE Energy)	7	25	9	25	12	-	-	-	Would be good to have employment estimates in other technology chapters as well.	We agree that this would be useful, but that is a comment better provided to those other chapters; This is outside the scope of the Wind Chapter.
Rosinski (Electric Power Research Institute)	7	25	6	25	6	7.4.1	-	-	"Delete commas in "...way in the years ahead as the technology becomes more mature, and as on-shore wind sites become□""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	25	2	25	16	7.4.1	-	-	Already said earlier	Some reiteration is ok, but we will look into possible reduction of one of the statements
Rosinski (Electric Power Research Institute)	7	25	20	25	20	7.4.2	-	-	"Change ""centred"" to ""centered""	We are using the British form of English
Twidell (AMSET Centre)	7	26	-	-	-	-	7.10	-	Add, perhaps with another graph, per capita cumulative by country. This points to those countries faced with, and coping with, grid saturation and variability issues.	We already provide % of electricity supply figures, which are close to per capita figures, and that seems sufficient in order to present the data in multiple days. In addition, electricity supply is more meaningful than MW/capita in our view.
Sawyer (Global Wind Energy Council)	7	26	-	-	-	-	7.10	-	TOP 10 end of 2009 update: USA(35GW), Germany(26GW), China 25GW, Spain 19GW, India 11GW, Italy 4.9GW,France 4.5GW, UK 4.0 GW ,Protugal 3.53GW, Denmark 3.46GW.(GWEC, 2010) Reference: GWEC 2010. Global wind power boom continues despite economic woes. Brussels. http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=247&tx_ttnews[backPid]=97&cHash=8a55b8eab5	Accepted
Sawyer (Global Wind Energy Council)	7	26	-	-	-	-	7.11	-	Update with 2009 data: Europe(10.5GW), North America (10.9GW), Asia (14.GW), Latin America 0.62GW, Africa and middle east (0.23GW), Pacific (0.57GW) (GWEC, 2010),Reference: GWEC 2010. Global wind power boom continues despite economic woes. Brussels. http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=247&tx_ttnews[backPid]=97&cHash=8a55b8eab5	Accepted
Sawyer (Global Wind Energy Council)	7	26	2	26	9	-	-	-	"updating with 2009 figure: change 66GW into 76GW, change end of 2008 into ""end of 2009"" , change 55% into""48%"" (GWEC, 2010) Reference: GWEC 2010. Global wind power boom continues despite economic woes. Brussels. http://www.gwec.net/index.php?id=30&no_cache=1&tx_ttnews[tt_news]=247&tx_ttnews[backPid]=97&cHash=8a55b8eab5 "	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	27	-	-	-	-	7.12	-	"Explain ""other"" in the legend"	Accepted
Sawyer (Global Wind Energy Council)	7	27	4	27	5	-	-	-	"Update data of 2009: line 4, change ""in 2008"" into ""in 2009""; Change 36% into 39% (EWEA, 2010) Ref: EWEA, 2010. More wind power capacity installed last year in the EU than any other power technology. Brussels. http://www.ewea.org/index.php?id=60&no_cache=1&tx_ttnews[tt_news]=1792&tx_ttnews[backPid]=259&cHash=add00eb97 "	Accepted
Twidell (AMSET Centre)	7	27	15	-	-	-	-	-	TAKE CARE. Denmark exports much wind power and also imports. Very precise wording is needed here, since the skeptics jump on such vagueness.	We will revise text to be clear
Rosinski (Electric Power Research Institute)	7	27	13	27	13	7.4.2	-	-	"Delete comma in "...On this basis, and focusing only on the 20 countries with□""	Current comma placement is fine

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Twidell (AMSET Centre)	7	28	-	-	-	-	7.15	-	TAKE CARE Are all the data actual 'penetration', since many countries have grids tied into other countries, especially Denmark. Chose the appropriate words and caveats.	We will revise text to be clear
Gagnon (Hydro-Quebec)	7	28	8	-	-	-	-	-	"□developing, owning ""and operating wind power plants"" , from □"	Accepted
Rosinski (Electric Power Research Institute)	7	28	17	28	17	7.4.3	-	-	"Delete comma in ""...from local site-focused engineering firms, to global vertically integrated utilities□.""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	28	5	28	10	7.4.3	-	-	What is stated in these lines is not necessarily an indication of maturity. Please, let us be careful that the business structure that we already know for the oil sector is not necessarily good for the renewable energy sector.	This section is not suggesting that the trends are good or bad. It is simply suggesting that the increased interest in wind technology by large, multi-national companies indicates that the wind industry has reached a substantial volume such that the industry is not serving a niche market as compared to a decade ago. In general all references to "maturity" and "cost-competitiveness" throughout the chapter will be reviewed.
Kheshgi (ExxonMobil Research and Engineering Company)	7	29	13	29	15	-	-	-	"Suggest referencing the recent US NRC (2009) report 'Electricity from Renewable Resources' which was part of the America's Energy Future study which provides a basis for this statement in detail."	We will seek to include this and other citations
Philibert (International Energy Agency)	7	29	38	29	40	-	-	-	"Unclear what is meant here by ""(...) and market stability"". Market stability is not an approach; it is an objective. A better sentence would be ""policy transparency and predictability"". Continuity, is not the right word either; policies should reduce the support they offer over time to encourage technologies to market; they should not be steady - as implied by ""continuity""."	We will consider this phrase, but we may not use the exact wording suggested.
Kiviluoma (VTT Technical Research Centre of Finland)	7	29	17	29	18	-	-	-	Barrier (2) could include the difficulty of building and using cross-border transmission to access the best resources	Accepted
Paredes (Inter-American Development Bank)	7	29	8	29	8	-	-	-	Is there a source for the fact that wind installations decline in 2009 as mentioned? According to GWEC new wind installed capacity in 2009 remained constant. Please verify with the latest GWEC figures.	Accepted
Philibert (International Energy Agency)	7	29	38	30	10	-	-	-	Some mention should be made that economic support policies must relate to electricity produced not capacity installed in order to ensure that efficient plants are built and to retain investor interest over the complete project lifetime.	Though we agree with this point, it is best left to the policy chapter as it is not wind specific
Dunn (GE Energy)	7	29	8	-	-	-	-	-	With wind energy additions falling in 2009' needs updating as additions rose. See SRREN_Draft1_Review_Dunn_Seth_Material_01.pdf.	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	29	14	29	14	7.4.4	-	-	"I suggest to add ""local and global"" before ""...environmental□"" "	This addition seems unnecessary to us
Twidell (AMSET Centre)	7	29	-	-	-	7.4.4	-	-	"Missing in this section is the Impact of Policies on PLANNING procedures and outcomes. Public acceptance and rejection through Planning procedures is a dominant factor; far more important than present technical issues."	This section identifies planning repeatedly, along with the other barriers identified, and also identifies planning as important from a policy perspective. The focus on planning is no more or less dominant than the other factors discussed in this section.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	29	15	29	15	7.4.4	-	-	"Please add ""and internalized"" after the word ""monetized""."	Accepted

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	29	38	29	48	7.4.4	-	-	Coherent energy policies are needed to price each energy resource adequately	This point is a good one, but really needs to be made in the policy chapter. Our remit was to focus on wind-specific policy issues.
Rosinski (Electric Power Research Institute)	7	29	39	29	45	7.4.4	-	-	This sentence is too long. Separate it into two sentences	Accepted
Rosinski (Electric Power Research Institute)	7	29	42	29	42	7.5.2	-	-	"Change ""...than conventional generation,□"" to ""□from those of conventional generation;...""	Accepted
Rosinski (Electric Power Research Institute)	7	29	44	29	44	7.5.2	-	-	"Delete commas from ""...wind energy resource and, therefore, the cost□""	Accepted
Abed (National Research Center)	7	29	28	29	29				omit:"fed.....technology"	we will not omit text but we will clarify
Dunn (GE Energy)	7	30	-	-	-	7.5	-	-	As noted in expert review meeting, coordination with integration chapter is critical.	We agree. Coordination is ongoing and active.
Twidell (AMSET Centre)	7	30	17	-	-	-	-	-	"Avoid the word 'level'; it usually means nothing as such. Here '.. of increased integrated capacities of wind power is□"	Accepted
Twidell (AMSET Centre)	7	30	16	-	-	-	-	-	"in the near term"; this has no meaning, since situations vary so greatly. Not true for Denmark and NE Germany for instance. Qualify by 'In the near term for the majority of situations□"	We will change language from near term to low to medium penetration
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	30	41	-	-	-	-	-	"Use ""generation"" instead of ""energy"" (twice in the same line)"	Generation is not accurate terminology as used in chapter and report; Second instance of wind energy could be changed to wind power. Next sentence change to:- Several important characteristics are different from conventional generation; and these characteristics must be considered in the integration of wind power into electricity systems.
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	30	22	-	-	-	-	-	"Use ""power"" instead of ""energy"""	Should be power; a very careful edit is necessary to provide consistency. Typically based on average time; power is short term; energy is longer term.
Twidell (AMSET Centre)	7	30	18	-	-	-	-	-	..increased operating experience, improved wind prediction and extended control□.(i.e. improved technology is important, not just experience).	Accepted
Hegde (Suzlon Energy Ltd)	7	30	13	-	13	-	-	-	lack of clarity in the sentence	We will revise accordingly
Bonduelle (EE Consultant)	7	30	-	-	-	7.5.1	-	-	Maybe quote as a complement (even more than electric vehicles) the coupling with other Renewable Energies e.g. http://kombikraftwerk.de/	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	30	20	30	20	7.5.1	-	-	"Please, replace ""electrical"" for ""system"""	We will use "electric system" instead
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	30	15	30	15	7.5.1	-	-	"Please, replace ""size"" for ""magnitud"""	Accepted

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	30	24	30	30	7.5.1	-	-	"The subpara starting with ""Long-term integration"" up to the end of line 30 is not clear. I suggest to leave these concepts to chapter 8."	The text will be reviewed for clarity, but we retain the concepts as it provides a useful link to chapter 8, and thereby helps identify what we are not covering in the wind chapter. In addressing a comment below we will introduce the concept of total re-design of electricity markets as a topic in Chapter 8. We will reverse the two sentences to introduce ch. 8 topics.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	30	45	30	45	7.5.2	-	-	""high average wind speeds"" does not necessarily mean high quality wind resource."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	30	39	30	41	7.5.2	-	-	The first sentence is confusing as starting sentence.	Mark to re-write
Abed (National Research Center)	7	30	43						add:"of" before wind	Accepted
Abed (National Research Center)	7	30	33						omit:"s" from operations	Accepted
Twidell (AMSET Centre)	7	31	-	-	-	-	7.14	-	Ordinate label and caption do not correspond. The graph should be 'Proportion of total electricity generation supplied from wind' (Island of Ireland or Irish Republic or what? The present label and caption infer something to do with capacity? NOT CLEAR.	Accepted
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	31	7	-	-	-	-	-	"Use ""operation"" instead of ""operations"""	Accepted
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	31	9	-	-	-	-	-	"Use ""power"" instead of ""energy"""	Power is an instantaneous value; energy is an integrated value. The section will be reviewed for consistency insofar as possible.
Rabl (Vision & Results)	7	31	4	-	14	-	-	-	The discussion of variability would benefit from reviewing BPA (Bonneville Power Administration) real-time on-line wind data and the recently completed NREL Western Wind and Solar Integration Study.	Mark and Andrew to include EWITS and WWSIS
Holttinen (VTT Technical Research Center of Finland)	7	31	9	31	9	-	-	-	wind energy --> system wide wind energy (or wind energy dispersed in power system area)	This paragraph will be revised to clearly explain the difference between power output from individual wind projects, and aggregated power output from a group of projects.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	31	1	31	1	7.5.2	-	-	""lower quality"" does not mean ""lower wind speed average""."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	31	4	31	4	7.5.2	-	-	"Please, replace ""wind project"" for ""wind farm"""	See earlier comments; we will seek further consistency
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	31	6	31	6	7.5.2	-	-	"Please, replace ""wind projects"" for ""wind farms"""	See earlier comments; we will seek further consistency

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Holttinen (VTT Technical Research Center of Finland)	7	32	-	-	-	-	7.15	-	"This graph should be changed to one that shows the issue better. This is for one wind farm, should be for system wide wind power. Also the persistence lines not needed, and actually the real forecasts do not show a clear error increase over time (with this scale) also the legend is not clear. German or Danish data should be available in this format (I have a clear graph from Finland if no better is found)"	Entire figure will be replaced with a better one
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	32	-	-	-	-	7.15	-	The figure is not so relevant e can be removed	We agree that this figure itself is not useful, but one that covers wind forecasting better will be included
Twidell (AMSET Centre)	7	32	13	-	14	-	-	-	□ the electrical characteristics of ALL wind generators differ □ conventional power PLANT, by being of different design (induction, multipole etc) and/or by incorporating solid-state electronic interfaces . Variable speed □	Accepted
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	32	7	-	-	-	-	-	"It is interesting to include here a picture showing these effects (attachment 1, from Ernst B. ""Analysis of wind power ancillary services characteristics with German 250 MW wind data"" - also in Holttinen ""Hourly wind power variations in the nordic countries"") "	Consider including graphic that demonstrates benefits of geographic diversity, perhaps as part of Figure 7.14; Space constraints must be considered.
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	32	30	-	-	-	-	-	"Use ""generation"" instead of ""energy"""	Generation is not accurate terminology;
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	32	2	-	-	-	-	-	"Use ""power"" instead of ""energy"""	Power is an instantaneous value; energy is an integrated value. The section will be reviewed for consistency insofar as possible.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	32	13	-	22	-	-	-	Coordination is needed with the last part of Section 7.3.4 to avoid overlaps	Section 7.3.4 will focus on the physical turbine characteristics. Section 7.5.3.2 will focus on electric system characteristics related to system inertia. This text will be moved to 7.5.3.2 for consistency. A cross-reference will be provided.
Holttinen (VTT Technical Research Center of Finland)	7	32	13	32	22	-	-	-	Could be rephrased more generally not only bringing up inertia issue but others	Section 7.3.4 will focus on the physical turbine characteristics. Section 7.5.3.2 will focus on electric system characteristics related to system inertia. This text will be moved to 7.5.3.2 for consistency. A cross-reference will be provided.
Holttinen (VTT Technical Research Center of Finland)	7	32	25	32	25	-	-	-	Could be rephrased more generally to include also market operation	Discussion of markets is included in the operations section, 7.5.4.1. This topic is somewhat outside the scope of near-term integration issues covered in Chapter 7. It is in the scope of Chapter 8. Note to authors: Variations in market structure and variations in wind penetration differ among countries, and this will be mentioned more clearly in the text.
Milborrow ((Sole proprietor)	7	32	13	-	22	-	-	-	Material has been discussed earlier and could be deleted	Section 7.3.4 will focus on the physical turbine characteristics. Section 7.5.3.2 will focus on electric system characteristics related to system inertia. This text will be moved to 7.5.3.2 for consistency. A cross-reference will be provided.

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Kiviluoma (VTT Technical Research Centre of Finland)	7	32	13	32	22	-	-	-	The point was already made in 7.3.4. and is maybe redundant in one or the other? Furthermore, the chapter here is 'Wind energy characteristics' and the problem fits better the next chapter (7.3.5.) 'Planning power systems with wind energy'. It could fit the sub chapter 7.5.3.2 as inertia response is beginning to be required in some grid codes.	Section 7.3.4 will focus on the physical turbine characteristics. Section 7.5.3.2 will focus on electric system characteristics related to system inertia. This text will be moved to 7.5.3.2 for consistency. A cross-reference will be provided.
Twidell (AMSET Centre)	7	32	10	-	-	-	-	-	What is 'a quantity of wind?'. Be specific.	Accepted
Bonduelle (EE Consultant)	7	32	-	-	-	-	7,15	-	This graph should be supplemented with more explanations	Entire figure will be replaced with a better one
Kruger (South African Weather Service)	7	32	1	32	1	7.5.2	7.15	-	Explain/define the abbreviations in the legend in the caption.	Entire figure will be replaced with a better one
Rosinski (Electric Power Research Institute)	7	32	14	32	14	7.5.2	-	-	"Change ""on"" to ""in ""...generators found on most conventional power projects.""	Accepted
Rosinski (Electric Power Research Institute)	7	32	5	32	5	7.5.2	-	-	"Change ""output"" to ""outputs""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	32	7	32	10	7.5.2	-	-	"Not clear why. Also please use wind farm or wind park or wind turbines instead of ""wind project""	Accepted
Veers (Sandia National Laboratories)	7	33	14	-	-	-	-	-	"Change ""continued development"" to ""increased deployment""	Accepted
Twidell (AMSET Centre)	7	33	4	-	-	-	-	-	"Power system SIMULATION models [i.e. not physical; could add 'computer based']"	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	33	15	-	16	-	-	-	"replace ""continued development of wind energy [TSU: technology"" with ""increasing exploitaion of wind energy""	Accepted
Gagnon (Hydro-Quebec)	7	33	13	-	-	-	-	-	"R□rence possible: considerable progress in this area ""(Larose et al., 2009)"" reference: ""Larose C, Gagnon R, Turmel G, Giroux P, Brochu J, McNabb D, Lefebvre D. 2009. ""Large Wind Power Plants Modeling Techniques for Power System Simulation Studies"". 8th International Workshop on Large-Scale Integration of Wind Power into Power Systems. Bremen, Germany.""	Mark to review citation and consider inclusion
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	33	1	-	-	-	-	-	"Use ""power"" instead of ""energy"" (in TSU:)"	See earlier comments; we will seek further consistency
Holttinen (VTT Technical Research Center of Finland)	7	33	36	33	37	-	-	-	Reactive power control especially important if there are weak parts of network	Mark to add text as needed
Holttinen (VTT Technical Research Center of Finland)	7	33	31	33	33	-	-	-	This sentence could be clarified	Greater clarity will be provided
Holttinen (VTT Technical Research Center of Finland)	7	33	-	-	-	7.5.3.1	-	-	also dispatch/unit commitment models should be mentioned here	Dispatch/unit commitment models will be mentioned in 7.5.4.1 with respect to operations. This section discusses system planning. A fuller discussion of the issue is included in Chapter 8. Note to authors: p. 35, line 5-15. introduce terminology unit commitment models
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	33	27	33	27	7.5.3.2	-	-	"A ""project"" can not remain connected, a ""wind farm"" or ""wind turbines"" can."	We decided to refer to wind power plants which can remain connected. Note to authors: use a footnote to direct readers to glossary at first instance of wind power plant.

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Rosinski (Electric Power Research Institute)	7	33	34	33	34	7.5.3.2	-	-	"Change ""has"" to ""have"" in ""...project sizes and the penetration of wind energy has increased,□""	Accepted
Rabl (Vision & Results)	7	34	40	-	42	-	-	-	"Provide numerical ranges for the ""low level"" and ""high level"" statements."	Accepted
Twidell (AMSET Centre)	7	34	11	-	-	-	-	-	Add reference to David Milborrow 'Quantifying the impacts of wind variability', Energy, vol 162, issue EN3, p105-112, Inst. Civil Engineers, UK.	Mark and Andrew to review citation for relevance, and include as needed
Kiviluoma (VTT Technical Research Centre of Finland)	7	34	37	-	-	-	-	-	Maybe 'residual demand' would be more descriptive than 'net demand'?	Net demand will be defined more clearly, but this is the correct term, and is regularly used in the electricity sector.
Holttinen (VTT Technical Research Center of Finland)	7	34	36	34	36	-	-	-	Should be rephrased more generally to include also market operation : in electricity markets wind power is dispatched first as it is bid in with zero or even negative price (marginal price is zero of even negative is production subsidies are paid)	Text to be revised as appropriate
Holttinen (VTT Technical Research Center of Finland)	7	34	38	34	39	-	-	-	Two sentences to make it easier to read	Accepted
Kiviluoma (VTT Technical Research Centre of Finland)	7	34	41	-	-	-	-	-	What is the timescale of the step-change, from hour to hour?	Text to be clarified
Rosinski (Electric Power Research Institute)	7	34	29	34	29	7.5.3.3	-	-	"Change ""output"" to ""outputs"" in ""...between wind project output...""	Accepted
Rosinski (Electric Power Research Institute)	7	34	15	34	15	7.5.3.3	-	-	"Change ""toward"" to ""towards"" in ""The contribution of wind energy toward long-term reliability can be evaluated using standard□""	Accepted
Kruger (South African Weather Service)	7	34	28	34	28	7.5.3.3	-	-	"Replace ""increase"" with ""rise""."	Accepted
Kruger (South African Weather Service)	7	34	26	34	26	7.5.3.3	-	-	"Replace ""wind penetration levels"" with ""wind energy penetration levels""."	need consistency throughout chapter on this
Kruger (South African Weather Service)	7	34	1	34	1	7.5.3.3	-	-	"Replace ""wind projects"" with ""wind energy projects""."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	34	26	34	28	7.5.3.3	-	-	The sentence is not clear	Text to be clarified
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	34	42	34	43	7.5.4.1	-	-	"Clarification for the difference between ""demand"" and ""total demand"" should be added as a footnote."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	34	34	34	34	7.5.4.1	-	-	"Please, add the word ""operating"" between ""marginal"" and ""cost""."	Accepted
Gagnon (Hydro-Quebec)	7	35	13	-	-	-	-	-	"...and reliably ""operate"" power□"	Accepted
Kiviluoma (VTT Technical Research Centre of Finland)	7	35	7	-	-	-	-	-	minute-to-minute' should not change much even in the longer term, maybe 'In the near term' is not required here?	Using in the the near term language should generally be replaced, as near term issues are very different in Ireland than in France than in India.

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Dunn (GE Energy)	7	35	17	36	11	-	-	-	Policymakers often inquire as to wind's backup requirements and impact on fossil fuel use. This deserves treatment and is addressed in a recent IEEE article. See SRREN_Draft1_Review_Dunn_Seth_Material_04.pdf.	We discuss the technical aspects of fossil generation and backup capacity in 7.5.3.3. This point should be included in the Summary for Policymakers. The topic of backup capacity for variable generation is covered in Chapter 8, p. 31. Note to authors: with higher penetration of wind energy there is generally more capacity to provide peaking.
Rosinski (Electric Power Research Institute)	7	35	16	16	7	7.5.4.1	-	-	"Should add sentence that says, ""Another important consideration is that the resulting increased cycling of conventional generation can significantly increase wear and tear on the boiler and other equipment, reduce unit reliability, and increase maintenance cost.""	Some additional text to be added to reflect this
Milborrow ((Sole proprietor))	7	36	10	-	-	-	-	-	""Curtailment is expensive as wind projects have high fixed costs"" - would perhaps be clearer"	Text to be clarified
Veers (Sandia National Laboratories)	7	36	21	-	-	-	-	-	"Change to ""The Danish system operates without""	Accepted
Twidell (AMSET Centre)	7	36	29	-	-	-	-	-	"The island of Ireland ('Ireland is too vague; Republic of Ireland and Northern Ireland of UK are now interconnected under joint control. But there is also a cable to Scotlan. Need for a note and more precise statements)"	Accepted
Kiviluoma (VTT Technical Research Centre of Finland)	7	36	4	-	-	-	-	-	add 'other energy storages using electricity' to the list?	Electrical storage devices are already included in the list. Not clear what is being requested here.
Twidell (AMSET Centre)	7	36	20	-	-	-	-	-	Denamrk will wind generated electricity about 20% of Denmark's electricity demand (note Denamrk exports and imports electricity under Nordic control and with Germany). TAKE CARE ABOUT SIMPLISTIC SENTENCES	We will clarify Demand "penetration" levels
Holttinen (VTT Technical Research Center of Finland)	7	36	19	36	28	-	-	-	Experience of Denmark have more to add: West Denmark has operated for years with more than 20 % penetration. Peak power like Texas should be mentioned here as well to get the system size. Add day-ahead forecasts have been in use (and needed), no extra reserve capacity has been built due to wind power (AGC added to 140 MW power plant partly due to wind power), Storm event 8.1.2005 could be mentioned as well.	Accepted
Kruger (South African Weather Service)	7	36	7	36	7	7.5.4.1	-	-	"Replace ""wind projects"" with ""wind energy projects""."	We decided to refer to wind power plants.
Kruger (South African Weather Service)	7	36	9	36	10	7.5.4.1	-	-	"Replace ""wind projects"" with ""wind energy projects""."	We decided to refer to wind power plants.
Rosinski (Electric Power Research Institute)	7	36	28	36	28	7.5.4.2	-	-	"Change ""increased"" to ""increases"" in ""...Denmark markedly increased its wind energy supply""	Accepted
Rosinski (Electric Power Research Institute)	7	36	19	36	19	7.5.4.2	-	-	"Change ""with"" to ""where"" in ""Denmark has the largest wind energy penetration of any country in the world, with wind energy""	Accepted
Holttinen (VTT Technical Research Center of Finland)	7	36	-	37	-	7.5.4.2	-	-	Experience of Germany and Spain to require fault ride through when parts of the system have more than 3000 MW wind power installed (tripping due to grid fault is against the rule of largest single trip off less than 3000 MW)	We will include a reference with the discussion of fault-ride through in 7.5.3.2.

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Kiviluoma (VTT Technical Research Centre of Finland)	7	37	25	37	4	-	-	-	"A more complete list?: Impacts of wind energy on the operation of conventional power plants Reduction in operating costs due to reduced fuel usage Including CO2 emission costs Increased cycling and part-load operation Additional operational costs from system balancing Possible increase in reserve requirements due to wind power Impact of wind power on future power plant investments Decreased need for energy in the system System adequacy has to be maintained Capacity credit of wind power Transmission grid reinforcements/extensions Transmission system stability Impacts from different measures to mitigate the costs of variability and uncertainty "	These items are more relevant to future system and should be considered in Chapter 8. Section 7.5.5 will be reduced in length; due to space constraints this list will not be included at this level of detail. If a list is included it will clearly mention that is examples only, not intended to be comprehensive.
Rabl (Vision & Results)	7	37	21	-	-	-	-	-	"Provide a numerical range for ""modest, but not insignificant."""	Accepted
MANNEH (MINISTRY OF FINANCE AND ECONOMIC AFFAIRS)	7	37	15	46	17	-	-	-	The Chapter could be shortened from these areas without affecting the substance	Section 7.5.5. will be shorter by removing some case studies.
Rosinski (Electric Power Research Institute)	7	37	42	37	42	7.5.5	-	-	"Delete comma in ""...by the power system, if adequate□"""	Accepted
Twidell (AMSET Centre)	7	38	4	-	-	-	-	-	Impact of wind energy FOT THE ABATEMENT OF CO2 emissions	Accepted
Holtinen (VTT Technical Research Center of Finland)	7	38	24	38	24	-	-	-	you should add Tradewind reference to this	Accepted
Rosinski (Electric Power Research Institute)	7	38	21	38	21	7.5.5	-	-	"Delete comma in ""...uncertainty of wind energy, from the day-ahead..."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	38	25	38	35	7.5.5	-	-	This paragraph is not necessary.	This section will be reduced in length; and this paragraph will likely be deleted.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	38	36	38	46	7.5.5	-	-	This paragraph is too long.	This section will be reduced in length; and this paragraph will likely be deleted.
Dunn (GE Energy)	7	39	12	39	28	-	-	-	Another useful reference here would be the NREL Eastern Wind Integration and Transmission Study (and forthcoming Western study). See SRREN_Draft1_Review_Dunn_Seth_Material_03.pdf.	We will consider whether to include this, in addition to JCSP reference
Hegde (Suzlon Energy Ltd)	7	39	-	45	-	-	-	-	This is the crux of the whole chapter as well as the theme of the entire report. The assessment of the direct impact of the wind energy on environment and sustainable development is very weak. This section has to be backed up by scientific data and findings of the authoritative studies. On pg 40, the environmental positive impact of wind (CO2 mitigation) has been provided only for Germany. GWEC has estimated that 121GW of cumulative installations have led to saving of 157 Mln Tons of CO2 emissions in 2008 alone. Now with cumulative installations exceeding 157GW, this saving will only be greater. Similarly net impact could also be captured with more evidence. Another issue is sustainable development. There could probably also be a case or two on rural / remote area development. Both environmental & sustainable development impact of the wind business needs to be given a comparative analysis with other RE sources.	Chapter 7 covers aspects of wind technology. It is outside the scope of this chapter to compare generation technologies. That is the scope of other chapters, like Chapter 9 or Chapter 10. We will review text for clarity of message. The potential deployment section describes the future potential for wind technology to offset carbon emissions. We will seek a reference for global carbon offset to replace the German reference.

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	39	1	39	28	7.5.5	-	-	These paragraphs can be summarized	This section will be reduced in length; and this paragraph will likely be deleted.
Abed (National Research Center)	7	39	27						DC= direct current	Accepted
Twidell (AMSET Centre)	7	40	11	-	-	-	-	-	In the longer term, new generating plants (which may be fossil fuelled or renewable energy) may be needed for balancing and back-up for sporadic periods and temporary power□□	We will note that new plants with wind are more likely to be flexible plants, not baseload
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	41	12	-	-	-	-	-	"Use ""power"" instead of ""energy"""	Need to decide what terminology to use for consistency; this instance should be "power"
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	41	13	-	-	-	-	-	"Use ""power"" instead of ""energy"""	Need to decide what terminology to use for consistency; this instance should be "power"
Rosinski (Electric Power Research Institute)	7	41	16	41	18	7.6.1.3	-	-	"Change ""decrease"" to ""decreases"" and ""create"" to ""creates"" in this sentence."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	41	24	41	24	7.6.1.3	-	-	The sentence is not clear (e.g. □ negligible to 7%??)	Accepted
Rosinski (Electric Power Research Institute)	7	42	26	42	26	7.6.2	-	-	"Change ""study"" to ""studies"""	Accepted
Rosinski (Electric Power Research Institute)	7	42	23	42	23	7.6.2	-	-	"Delete comma in ""...and bat fatalities, and the disruption of ecosystem structure."""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	42	21	42	23	7.6.2	-	-	"What is stated in these lines do not agree with what is stated below in section 7.6.2.1 (in particular the idea of ""primary ecological impacts""). In any case, why ""following the National Research Council of the U.S□"" and not following other authors like Erickson or Sovacool."	We will review text for clarity
Sawyer (Global Wind Energy Council)	7	43	43	43	47	-	-	-	Need a reference for this three sentences. And this section is have only one reference as (NRC, 2007), too much information from one single reference!	A reference related to the research being conducted with respect to grassland species will be sought. We need to discuss the need to obtain a larger number of references for the ecological impacts section, as many have complained that it is overly focused on a single document. We should describe NRC 2007 as a meta-study and refer to NRC 2007 and the references contained therein. We will check for the primary references that NRC uses and perhaps include these papers separately.
Rosinski (Electric Power Research Institute)	7	43	29	43	29	7.6.2.1	-	-	"Change ""at"" to ""by"" in ""Similar results have been found at studies conducted□"" "	Accepted
Kruger (South African Weather Service)	7	43	29	43	30	7.6.2.1	-	-	References for this statement are needed.	citations to be added, or statement to be eliminated
Rosinski (Electric Power Research Institute)	7	43	32	43	32	7.6.2.2	-	-	"Delete comma from ""...Ecosystem impacts, and□"""	These commas appear gramatically correct

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Jara Tirapegui (Endesa Eco S.A.)	7	43	-	-	-	7.6.2.2	-	-	In some cases and depending on the local regulation, there are relevant impacts too on protected flora, vegetation and fauna species, which need to be removed and relocated and finally, their environmental impacts mitigated or compensated. For example, some rodents and reptile species need to be carefully relocated or rescued before the wind farm construction.	Additional text to be added
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	44	12	44	12	7.6.2.2	-	-	""new breeding grounds"" are not necessarily positive impacts."	We will make the statement a bit more vague as to whether these are positive or negative impacts;
Rosinski (Electric Power Research Institute)	7	44	6	44	8	7.6.2.2	-	-	Missing reference numbers in brackets.	We will clarify
Rosinski (Electric Power Research Institute)	7	44	30	44	30	7.6.2.3	-	-	"Change ""analogy"" to ""analog"" in ""However, the numerical simulations used may not be an ideal analogy□""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	44	-	-	-	7.6.2.3	-	-	I believe that we are not yet in the position to claim robust knowledge on this subject. There is no real consensus regarding the conclusions of most of the existing studies. To these end I propose either to entirely skip this section or to make it extremely brief recognizing our limited knowledge. In the later case it must be stressed out that the questions posed in this section are only relevant when massive exploitation of wind energy is attempted in a limited area.	We believe that this topic is important to discuss in the wind chapter. This section summarizes knowledge to date; we believe that the text cautions the reader appropriately because there is a lack of robust knowledge. We will add emphasis to the concept that this is relevant for substantial wind energy deployment in a limited area.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	44	41	44	44	7.6.2.3	-	-	This conclusion is not necessary.	We believe that the statement is necessary to put the issue in context with other local climate impacts. We will delete the reference to GHG benefits of wind energy.
Milborrow ((Sole proprietor))	7	45	5	-	-	-	-	-	"suggest ""5-10 MW per square kilometre"" (many wind farms have higher power densities than 5 MW/sq km)"	Accepted
Rybach (Geowatt AG)	7	45	-	46	-	-	-	-	Sections 7.6.3.2 □Visual impacts□ and 7.6.4 □Public attitudes and acceptance□: The highly visible landscape changes, originating from wind generators, create a real issue in public acceptance. As often, development creates in mixed feelings. It shall be noted here that in Switzerland two national Wind Energy Associations exist: 1) Swiss Association for Wind Energy, and 2) Swiss Association against Wind Energy.	We will see if there is a tighter linkage that we can draw between visibility and public acceptance. We will not refer to any specific companies or organizations in favor or opposing wind energy.
Veers (Sandia National Laboratories)	7	45	39	45	41	-	-	-	This is not a good way to end a section. We should not be in the business of defining the meaning of landscape.	We are not defining the term itself, we are simply noting that the literature, especially in Europe, has very much proceeded down these lines. Other reviewers have very much wanted us to include this context here. We will look to edit the text to make it more clear, however.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	45	14	45	16	7.6.3.1	-	-	"The sentence starting with ""Where airplane□"" is too confusing."	Will be clarified
Smith (PNNL)	7	45	5	45	12	7.6.3.1	-	-	The issue of habitat fragmentation (primarily by access roads) should be mentioned in this paragraph.	Habitat fragmentation was covered earlier in this section, and the present subsection is focused on impacts on humans.

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Twidell (AMSET Centre)	7	45	-	-	-	7.6.3.2	-	-	"This section fails to recognise that visual impact is by far the greatest problem for public acceptance. So include: montages at planning applications, angular impact; height of impact at the nacelle or the top tip position; effect of rotation; speed of rotation and size; effect of understanding and education on acceptance; meaning of landscape and countryside; international variations and cultures [See and refer to 'Wind Turbines in View', Pasqualetti M.J., Gipe P. and Righter R.W. (2002) Academic Press with Reed Elsevier, San Diego; Academic Press, London. - an important book exploring all these factors]"	We will consider adding additional text
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	46	17	-	-	-	-	-	Reminder: A type-approved Wind Turbine has been designed under specific safety requirements for its life-time operation. Accidents have been drastically reduced for properly certified turbines and projects.	Additional text will be included.
Rosinski (Electric Power Research Institute)	7	46	15	46	15	7.6.3.3	-	-	"Change to ""...shed parts of or whole blades as a result of an accident or□""	Accepted
Rosinski (Electric Power Research Institute)	7	46	11	46	11	7.6.3.3	-	-	"Divide into two sentences, e.g. ""...al., 2005). In some countries, the□""	Accepted
Rosinski (Electric Power Research Institute)	7	46	16	46	16	7.6.3.3	-	-	"Divide into two sentences, i.e. □""entirely). Through 2001, there□""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	46	1	46	8	7.6.3.3	-	-	Analysis of the noise issue requires further develop.	Agreed, we need to add more material on this subject
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	46	19	46	19	7.6.3.4	-	-	The issues discussed above are not only aesthetic. Visual impacts, noise, etc. are not only aesthetic	Accepted
Kruger (South African Weather Service)	7	46	41	46	41	7.6.4	-	-	"Delete ""but""."	The point here is that impacts are often greatest between announcement and construction; we will try to clarify that point.
Rosinski (Electric Power Research Institute)	7	47	42	47	42	7.7	-	-	"Footnote 16: Change ""scaling"" to ""upscaling""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	47	40	47	42	7.7	-	-	The square-cube law is not solid science. Here is extensively use as part of the analysis in this section.	The use of quotation marks suggests that this is a "rule of thumb" rather than a scientific law. This terminology has been used commonly in the wind industry for decades. The footnote will be expanded to clearly state that this is not a scientific law.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	47	42	-	-	-	-	-	"replace ""suggests a natural size limit for wind turbines"" with ""suggests an optimum (limited) size for wind turbines at a given site and application""	Accepted
Rosinski (Electric Power Research Institute)	7	47	30	47	30	7.6.5	-	-	"Delete comma in ""...and facilities, and by proactive□""	Accepted
Abed (National Research Center)	7	47	3	-	-	-	-	-	N.B. omit:""all else....."	We do not see the terminology "all else" on this line, so are unable to make the requested change
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	48	1	-	-	-	-	-	"add after ""relation"" the following ""preventing a dramatic increase of the cost of energy of the larger machines,"" "	Accepted

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Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	48	30	-	-	-	-	-	"replace ""gird"" with ""grid"""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	48	30	48	30	7.7.1	-	-	"A typo in ""gird integration□"""	Accepted
Rosinski (Electric Power Research Institute)	7	48	30	48	30	7.7.1	-	-	"Change ""gird"" to ""grid"" in ""...improved and expanded manufacturing processes, gird integration of wind energy□"""	Accepted
Abed (National Research Center)	7	48	30	-	-	-	-	-	change gird to grid	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	50	6	-	-	-	-	-	"replace ""2009."" with ""2009), in the framework of the so called 'Strategic European Technology Plan, SET-Plan' [add reference]."""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	50	6	-	-	-	-	-	"replace ""member countries"" with ""member states"""	Accepted
Twidell (AMSET Centre)	7	51	-	-	-	-	7.20	-	What does 'for this work' mean on the graph for the red points?	Figure will need to be cleaned up substantially, and it will be
Veers (Sandia National Laboratories)	7	51	18	-	-	-	-	-	"Delete ""in other segments"""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	51	8	-	-	-	-	-	"replace ""In recent years"" with ""Due to technology advancements in recent years"""	Accepted
Veers (Sandia National Laboratories)	7	51	19	-	-	-	-	-	"Replace ""sacrificed too much aerodynamic performance"" with ""promise equivalent aerodynamic performance based on wind tunner tests, but have yet to be proven in the field."""	We will review text for clarity
Kruger (South African Weather Service)	7	51	12	51	12	7.7.3.2	7.20	-	Explain WindStats in caption of figure.	Figure will need to be cleaned up substantially, and it will be
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	52	17	-	-	-	-	-	"replace ""In UpWind"" with ""In the Integrated European 6th Framework R&D Programme UPWIND [add ref]"""	Accepted
Milborrow ((Sole proprietor))	7	52	39	-	42	-	-	-	"text gives the impression that direct drive generators are novel; as large numbers are now operational, perhaps modify?"	Accepted
Sawyer (Global Wind Energy Council)	7	52	34	52	35	-	-	-	Below rated power a soiled blade will still produce less even with pitch control so this last part of the sentence should be deleted.	We will review text and consider changes as necessary
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	52	-	-	-	7.7.3.3	-	-	Contrary to other sections this one is completely lacking references	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	53	32	-	-	-	-	-	"replace ""investigated"" with ""investigated in"""	Accepted

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contaldi (ISPRA, Institute for Environmental Protection and Research)	7	53	-	54	-	-	-	-	I propose to cut the para 7.7.3.7 . The detailed illustration of off shore design concepts is of little general interest.	We disagree. Offshore design concepts are highly important in areas with land constraints for onshore wind development, such as Europe, and considerable research attention is currently being placed on these concepts in several regions of the world.
Sawyer (Global Wind Energy Council)	7	53	3	52	4	-	-	-	There is no independent evidence that the Clipper technology offers any advantages and so the reference to multiple outputs should be deleted.	We will delete Clipper reference
Rosinski (Electric Power Research Institute)	7	53	9	53	9	7.7.3.4	-	-	"Delete comma in "...electronic component ratings, as well as innovative higher-voltage circuit topologies.""	Accepted
Rosinski (Electric Power Research Institute)	7	53	32	53	32	7.7.3.6	-	-	"Change to "...downwind wind turbines are being investigated for off-shore applications.""	Accepted
Rosinski (Electric Power Research Institute)	7	53	26	53	26	7.7.3.6	-	-	"Change to "...of the early turbines and, because the rotor speed was lower, they□"	Accepted
Rosinski (Electric Power Research Institute)	7	53	28	53	28	7.7.3.6	-	-	"Delete comma in "...operating at lower speeds, and offshore developments□"	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	53	-	-	-	7.7.3.6	-	-	"This is a rather ""weak"" section compared to its title. If it is only 2-bladed against 3-bladed in offshore then, perhaps, the section should be integrated in 7.7.3.7 "	Section will be renamed.
Christophersen (Climate and Pollution Agency)	7	53	37	54	26	7.7.3.7	-	-	"We propose that this section (or an other relevant section) includes a sub-section about the ""Hywind"" pilot project, the world's first full-scale floating wind turbine, developed by Statoil. A 2.3 MW pilot plant was installed off the Norwegian coast in 2009 and will be tested for a two year period. This project could be valuable for the further development of floating offshore wind power technology."	yes, this will be noted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	53	-	-	-	7.7.3.7	-	-	Some references are needed	Accepted
Nielsen (Statoil)	7	54	7	54	13	-	-	-	"Floating offshore wind turbines are already in the demonstration phase. Hywind (2.3MW) was installed offshore Norway at 220 m water depth in 2009, see http://www.statoil.com/en/TechnologyInnovation/NewEnergy/RenewablePowerProduction/Offshore/Hywind/Pages/HywindPuttingWindPowerToTheTest.aspx Here a ""standard"" 2.3MW turbine is used. Floating solutions may be cost effective solution within 5 -10 years."	yes, this will be noted
contaldi (ISPRA, Institute for Environmental Protection and Research)	7	54	-	58	-	-	-	-	I propose to cut the para 7.7.4. The text is in academic language and of little importance for the deployment of a mature technology.	We will reduce this text somewhat
Rosinski (Electric Power Research Institute)	7	54	25	54	25	7.7.3.7	-	-	"Delete comma in ""□locations, and therefore erecting□"""	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	56	26	-	-	-	-	-	"Add reference after ""1998"" as ""1998; P. Chaviaropoulos, M.O.L Hansen, 2000"" the actual reference being [P. Chaviaropoulos, M.O.L Hansen, ""Investigating 3-D and Rotational Effects on Wind Turbine Blades by Means of a Quasi-3D Navier-Stokes Solver"", Journal of Fluids Engineering, Vol. 122, pp 330-336, June (2000).]"	Maureen to review for possible addition

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Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	56	5	-	-	-	-	-	"Add reference, replace ""Snel, 2003"" with ""Snel, 2003; Chaviaropoulos et al., 2003"" the actual reference being [P.Chaviaropoulos, et. al. 'Viscous and Aeroelastic Effects on Wind Turbine Blades. The VISCEL Project. Part I: 3D Navier-Stokes Rotor Simulations', Journal Wind Energy, Vol.6, pp. 365-385, (2003)] "	Maureen to review for possible addition
Rosinski (Electric Power Research Institute)	7	56	3	56	3	7.7.4.1	-	-	"Delete parentheses around ""BEM""	Accepted
Milborrow ((Sole proprietor))	7	57	22	-	23	-	-	-	text seems to imply that a reduction in rotor speed (with the aim of reducing noise) can be realised without compromising aerodynamic performance. Is this correct?	Maureen and Peter to review text for accuracy
Rosinski (Electric Power Research Institute)	7	57	31	57	31	7.7.4.2	-	-	"Change to read ""...downwind designs because, in downwind machines, the □""	Accepted
Veers (Sandia National Laboratories)	7	58	31	58	38	-	-	-	These comments have more to do with current practice than underpinning science and belong in 7.7.3.2 Advanced Rotors and Blades.	The concepts will be covered in 7.7.3.2, with consideration of overall page limitations.
Gagnon (Hydro-Quebec)	7	59	14	-	-	-	-	-	""Physical and statistical"" modelling approaches□"	Accepted
Gagnon (Hydro-Quebec)	7	59	38	-	-	-	-	-	"□future(7.8.4). ""The competitiveness of wind energy, which includes other factors like subsidies and economic factoring of environmental externalities, is not covered in this section.""	Cost-competitiveness including subsidies and external environmental costs is not covered in this section or in this chapter. Relative competitiveness of generation options is outside the scope of the wind chapter.
Kheshgi (ExxonMobil Research and Engineering Company)	7	59	30	59	32	-	-	-	"Suggest adding to the end of the first sentence 'IEA, 2009b); although cost competitiveness generally remains a primary barrier to wind energy (NRC 2009).' The recent US NRC (2009) report 'Electricity from Renewable Resources' which was part of the America's Energy Future study found that cost competitiveness in one of the primary barriers to wind."	We will include the spirit of the comment, but not necessarily the exact wording. Also add economic policies are used to improve competitiveness.
Sawyer (Global Wind Energy Council)	7	59	41	59	41	-	-	-	it is not clear why financing costs and operating life are linked as one single cause.	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	59	41	59	41	7.8.1	-	-	"I suggest to include ""project operating lifetime"" as a fifth factor"	Accepted
Kruger (South African Weather Service)	7	59	43	59	43	7.8.1	-	-	"Insert ""power"" before ""generation""."	Accepted
Abed (National Research Center)	7	59	41	-	-	-	-	-	omit:"and", "/" and add and to be: costs,financing costs and project operating life.	Accepted
Sawyer (Global Wind Energy Council)	7	60	25	60	25	-	-	-	"Clarification required ""20% of total wind project expenditure"" - I assume this is when expressed as a levelised cost as annual costs are around 3.5% of capital expenditure"	Accepted
Paredes (Inter-American Development Bank)	7	60	1	60	1	-	-	-	It is more the quantity (mean wind speed) than the quality (turbulence levels, shear etc) that determines the annual energy production. So the word quality has to be changed or say quality and quantity.	We will consider revising this text, but we may not use the precise terms suggested by the reviewer.
Rosinski (Electric Power Research Institute)	7	60	5	60	5	7.8.1	-	-	"Change to read ""...energy production per MW rated capacity, and has also allowed□""	Accepted
Rosinski (Electric Power Research Institute)	7	60	19	60	20	7.8.1	-	-	"Change to read, ""...considerably more costly than those of on- shore projects□""20 shore projects□""	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	60	6	60	7	7.8.1	-	-	"Use either ""better wind resource"" or ""higher wind speeds""	Accepted

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Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	60	25	60	25	7.8.1	-	-	It should be clarified if the 20% is on Present Value basis.	Accepted
Twidell (AMSET Centre)	7	61	-	-	-	-	7.22	-	What basis or year is taken for these costs? I.e. how is inflation taken into account? State this in the caption.	All cost data are in 2005\$, as should be clear in the introduction of the SRREN report
Nielsen (Statoil)	7	61	12	61	16	-	-	-	Include statements related to size effects: Larger wind parks will trigger more efficient installation procedures and dedicated vessels, enabling lower costs.	Accepted
Milborrow ((Sole proprietor))	7	61	-	-	-	Note 20	-	-	"the term ""drive train platform"" is not common. Nacelle is more usual? The clarity of the note could perhaps be improved."	Accepted
Sawyer (Global Wind Energy Council)	7	63	7	63	8	-	-	-	"change sentence into ""driven in part by the low cost of labor and low-installed-cost wind turbines"""	Accepted
Sawyer (Global Wind Energy Council)	7	63	33	63	33	-	-	-	Garrad Hassan published a report looking into offshore wind costs in 2009, it found that future offshore wind capital costs were dependent in part to the extent to which offshore turbine manufacturing decoupled from onshore wind turbine manufacturing. http://bwea.com/pdf/publications/ChartingtheRightCourse.pdf	We will review report and consider for possible inclusion
Kruger (South African Weather Service)	7	63	25	63	25	7.8.3.1	-	-	"Insert ""energy technology"" after ""wind""."	Accepted
Kruger (South African Weather Service)	7	63	38	63	38	7.8.3.1	-	-	"Insert ""from"" before ""\$2,000/kW..""."	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	63	42	63	46	7.8.3.2	-	-	The reference to countries for analyze project performance is not meaningful. Regions and subregions should be used instead.	Text notes that variation exists within a country from 20% to 50% already. Country level average data are also helpful in understanding the relative economics of wind across countries.
Kheshgi (ExxonMobil Research and Engineering Company)	7	64	1	64	4	-	-	-	"Boccard (2009) referenced in the chapter as giving capacity factors of 20-30% states in its Table 2 a US cf of 25.7% and a EU-15 cf of 20.8% for 2003-2007. This is considerably lower than the cf for the US of 34% given in line 2. A clear assessment of the issues involved in these capacity estimates would be useful and both should be stated if it is unclear which is correct."	The Boccard paper unfortunately has not interpreted US capacity factor data correctly. The data provided in the IPCC chapter are accurate.
Paredes (Inter-American Development Bank)	7	64	2	64	2	-	-	-	It should be worth mentioning that capacity factors on other regions different that EU and US, normally require higher capacity factors in order to be economically feasible: wind farms in Mexico show capacity factor between 35% (lower range) and 50% (high range).	We will try to add data from a broader number of regions
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	64	5	64	5	7.8.3.2	-	-	The reference to countries for analyze project performance is not meaningful. Regions and subregions should be used instead.	Text notes that variation exists within a country from 20% to 50% already. Country level average data are also helpful in understanding the relative economics of wind across countries.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	64	18	64	19	7.8.3.3	-	-	""total delivered cost of wind energy"" is the same as ""levelized cost of energy""? This should be clarified."	Let's consider a footnote directing reader to glossary for proper terminology.
Rosinski (Electric Power Research Institute)	7	64	31	64	31	7.8.3.4	-	-	Need to also specify the levelized fixed charge used to calculate the capital component of levelized cost.	This is noted in the appendix, and we will link to that
Nielsen (Statoil)	7	65	28	65	30	-	-	-	"Define clearly the ""learning rate"", e.g. ""percent cost reduction per year at average in the period of time considered"" or □? How is inflation accounted for?"	The learning rate is already defined in sufficient detail in lines 24-27.

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contaldi (ISPRA, Institute for Environmental Protection and Research)	7	65	-	67	-	-	-	-	I found quite interesting para 7.8.4.1 and I thank the authors. The forecasted learning curve and the actual figures diverge so much that this is a lesson for all renewable technologies deployment costs estimates.	not an actionable comment
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	65	8	65	9	7.8.3.4	-	-	The statement made in the last sentence needs further explanation since it seems a priori that the increasing off-shore development is due to economic reasons besides constraints in land availability.	The text will be reviewed for clarity,
Rosinski (Electric Power Research Institute)	7	65	29	65	29	7.8.4.1	-	-	"4% to 32% of what?"...wide range of calculated learning rates, from 4% to 32%...."	We will seek to clarify this text
Milborrow ((Sole proprietor))	7	66	10	-	11	-	-	-	"the most appropriate cost measure for wind is arguably the levelised cost□" Given the much wider variations in generating costs (for reasons discussed earlier), it is not clear why this method is preferable. "	The comment is not clear to the chapter authors: levelised cost and generating cost are often used to mean the same thing. The term will be defined in the glossary.
Hegde (Suzlon Energy Ltd)	7	67	-	68	-	-	-	-	This is a relevant part that needs to be highlighted. Probably nos. from China & USA with the proper weightage should also be given so that the global picture can be seen. New Energy Finance can be a good source for this data. Another area that needs to be considered is the cost of abatement per ton of CO2 for varied RE sources.	We will seek in the SOD to present data that also conforms to the situation in China, with much lower installed cost figures. The cost abatement potential of renewables is not in the scope of the wind chapter.
Rosinski (Electric Power Research Institute)	7	67	24	67	25	7.8.4.2	-	-	"The cost reductions quoted in this sentence seem too high, ""...cost reduction estimates ranging from 18-39% by 2020, and 17-66% by 2030"" DOE estimates reported in this section are lower and seem more realistic. "	The DOE figures reported earlier were for ONSHORE wind, while this paragraph refers to OFFSHORE wind. As a less mature technology, engineering estimates suggest greater cost reduction potential for offshore wind, as noted by this literature.
Rosinski (Electric Power Research Institute)	7	68	25	68	26	7.9	-	-	Should mention bird and bat mortality as potential limiting factor here.	There are many limiting factors, and those are discussed elsewhere in the chapter, including on page 73. No need to reiterate all of the limiting factors here, as they are described in several places elsewhere
Gagnon (Hydro-Quebec)	7	68	25	-	-	-	-	-	□where environmental impacts are monetized: see Section 7.8): Unless mistaken, I did not see this covered in Section 7.8, which concentrates on Cost trends, not on wind competitiveness. See previous comment.	Accepted
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	68	13	68	13	7.8.4.3	-	-	It refers to Figure 7.26. Should not be 7.25?	Accepted
Kiviluoma (VTT Technical Research Centre of Finland)	7	69	19	-	-	-	-	-	It could be mentioned, that in many of the global energy models (if not in all) wind power is limited by binding penetration limits that cannot reflect physical reality due to necessary modelling simplifications in global scale models. The results presented in the chapter should be taken with a grain of salt.	This is outside the scope of the wind chapter, and these models will be discussed in Ch. 10. We will not evaluate those models: the Mitigation Chapter should do so, if anywhere in the report. It is important to consider that some of the models are favorable towards wind, for example, by not addressing integration and transmission needs. These details, however, are better left to the Mitigation Chapter, where these models are discussed in more detail.

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Hegde (Suzlon Energy Ltd)	7	69	-	69	-	-	-	-	While the paper has made an attempt to provide near term forecasts, it would have been more useful to create 2-3 scenarios on what the wind sector is capable of. A) Meeting energy demands, b) CO2 reduction. The scenarios could be for 2020, 2030 & 2050. If there are any hopes of meeting the 450 PPM target, each RE source would need to be employed in specific quantities, based on their potential & scalability.	The remit for this section is to report on the available literature, as included here, not to create new forecasts. However, the next section on long term forecasts does include 2020, 2030, and 2050 data under a wide range of GHG emissions reduction scenarios, and those results are summarized in that subsection.
Rosinski (Electric Power Research Institute)	7	69	-	69	-	7.9.2	7-27	-	What are units on vertical axis?	Accepted
Abed (National Research Center)	7	69	28	-	-	-	-	-	add:"in" after provided	Accepted
Abed (National Research Center)	7	69	29	-	-	-	-	-	add:"on" before wind	Accepted
contaldi (ISPRA, Institute for Environmental Protection and Research)	7	70	-	-	-	-	7.26	-	this figure could be eliminated, to cut pages. Wind electricity produce electricity, so the next figure is more than enough.	As per agreement among all of the technology chapters and the mitigation chapter, we have agree to include and discuss both figures such that EJ can be reported consistently across all chapters
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	70	-	-	-	-	7.27	-	Figures 7.26 and 7.27 can be alinged for saving space	Accepted
Sawyer (Global Wind Energy Council)	7	70	4	70	4	-	7.27	-	the y axis units is not clear	Accepted
Rybach (Geowatt AG)	7	70	2	-	-	-	-	-	line 2 should read: Figure 7.26. □Global total primary energy supply of□□	Accepted
Kruger (South African Weather Service)	7	70	2	70	3	7.9.2	7.26	-	Explain abbreviations in legend.	Accepted
Kruger (South African Weather Service)	7	70	5	70	6	7.9.2	7.27	-	Explain abbreviations in legend.	Accepted
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	71	21	-	-	-	-	-	Figures 7.9.1 and 7.9.2 non-existing, replace with 7.26 and 7.27	Accepted
Sawyer (Global Wind Energy Council)	7	71	2	-	-	-	7.9.1	-	The text (page 71 line 2) refers to figure 7.91. but the figure is not included in the report.	Accepted
Sawyer (Global Wind Energy Council)	7	71	5	-	-	-	7.9.2	-	The text (page 71 line 5) refers to figure 7.9.2 but the figure is not included in the report	Accepted
Kruger (South African Weather Service)	7	72	17	72	17	7.9.2	-	7.8	"Explain ""Advanced"", ""Energy Revolution"" and ""BLUE"" in caption."	Accepted
Kiviluoma (VTT Technical Research Centre of Finland)	7	73	-	-	-	note 23	-	-	Could be added: Kiviluoma J, Meibom P. Influence of wind power, plug-in electric vehicles, and heat storages on power system investments. Energy. In Press, Corrected Proof.	We will review the citation for relevance
Abed (National Research Center)	7	73	29	-	-	-	-	-	add:"improvements"	Accepted

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Allal (Observatoire Méditerranéen de l'Énergie (OME))	7	74	-	-	-	-	-	-	Reference, Please add: www.ome.org www.remap-ec.eu Ben Jannet Allal H., Hoyer-Klick C., Fernandez M., Ruiz Lazaro A. (2008), Action Plan for the Development of Renewable Energy in South and East Mediterranean countries. Proceedings remap	We will review the citation for relevance
Renne (National Renewable Energy Laboratory)	7	-	-	-	-	7.2	-	-	"Overall a very well-written, well-referenced and thorough Section. There needs to be consistency in use of ""theoretical, technical, and economic"" potential terminology in the report."	The SRREN glossary defines these terms; we will link our discussion to that glossary; we may also include a note in the relevant table to define the terms for our purpose
Woyte (3E sa)	7	-	-	-	-	7.5	-	-	"Section on ""Near-term integration issues"": ensure complementarity with Chapter 8."	We agree, and coordination is ongoing,
Tolmasquim (Empresa de Pesquisa Energética - EPE)	7	-	-	-	-	7.5	-	-	"The section addresses only the (detrimental) consequences of wind power variability in the time frame of electric phenomena (reliability and capacity credit). No reference is made to the wind small yearly variability (smaller than hydro) and its benefits in terms of energy security. Also, in some hydro systems, Brazil for instance, wind and river flows are negatively correlated, so wind power contributes to increase energy reliability and to displace the back up fossil fuel generation (see Dr. Lennart Soder in ""Wind energy impact on the energy reliability of a hydro-thermal power system in a deregulated market"")."	We believe that the coverage of capacity credit does include energy security benefits and other positive benefits. The detailed discussion on interannual variation in capacity credit should be covered in Chapter 8.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.5	-	-	The section is too long, having some potential for space reduction (1 to 2 pages) in particular from sub-sections 7.5.4 and 7.5.5	We are considering ways to reduce the length of the text in this section without significantly reducing content.
Takeuchi (Advanced Industrial Science and Technology)	7	-	-	-	-	7.7	-	-	Chapter 7.7 has too much volume including R&D roadmap of EU countries. This chapter should be described from the stand point of worldwide. Authors should write this chapter from more global stand point of view.	We suggest that the reviewer be contacted by the TSU to provide additional references for inclusion; we will also seek additional literature.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.8	-	-	Following the above recommendations, section 7.8 can be shortened by 2 pages	We will consider "the above recommendations" separately. We will shorten the text.
Nielsen (Statoil)	7	-	-	-	-	-	7.1	-	Does these wind maps tell anything of significance?	The maps are not ideal, we admit, but we believe that they offer useful visual evidence of the greater geographic detail offered in the most recent wind resource mapping efforts
Kiviluoma (VTT Technical Research Centre of Finland)	7	-	-	-	-	-	7.15	-	This figure is hard to understand. Just one forecast error would be enough, the different forecasts in the figure are not explained and they are not needed at the level of detail relevant for this publication. Furthermore, the figure has only one wind farm and this is not usually relevant for the power system. The combined prediction error of wind farms in one grid region should be in the figure.	This figure will be replaced with a better one
Milborrow ((Sole proprietor))	7	-	-	-	-	-	7.2	-	"clarification needed. Where is the ""power"" axis? What is the reference for Windstats?"	This figure will be replaced with a better one
Nielsen (Statoil)	7	-	-	-	-	-	7.20	-	"The legend seems strange. Does ""power"" mean a power curve fitting to data?"	This figure will be replaced with a better one

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Kiviluoma (VTT Technical Research Centre of Finland)	7	-	-	-	-	-	7.25	-	In figure 7.25 starting point for turbine costs is from 2008, which is a much higher starting level due to mostly(?) temporary factors mentioned in the 7.8.3.1. In fact, with the already materialized cost reduction during 2009 (-25% investment costs) the current levelized cost for wind power is below what is expected as future cost reduction in 7.25. At least there should be a much higher downward uncertainty in the future wind power costs. It could very well be that the investment cost level of 2003-2004 is reached and passed in the future with higher capacity factor turbines.	Cost reduction in 2009 for turbines may be closer to 10-15%, and this will be revised in the text, but the point is well taken. However, costs in 2009 in the US, at least, were much higher than in 2008 due to working through older turbine orders. As such, using 2008 as the base year may not be a terrible approximation of costs in a normal supply-demand environment. As such, we believe that the current starting point values are not inappropriate. That said, the figure will be modified to also include the lower costs experienced in the world's largest wind market: china.
Kleidon (Max-Planck-Institute for Biogeochemistry)	7	-	-	-	-	-	7.1	-	What is meant by theoretical potential? In total, the atmosphere contains about 900 TW or 28,000 EJ/yr of wind power. What is listed in Table 7.1 seems to be the possible extraction potential by technical means. This differs from estimates in other sections, where it is estimated how much is out there in total, rather than reasonable estimates of how much can be extracted. In this sense, the table should also list the total wind power in the atmosphere of 28,000 EJ/yr. Reference: e.g. Peixoto and Oort (1991), Physics of Climate, AIP Press.	We will try to clarify this, but in short, this datapoint is somewhere in between what one might consider theoretical and technical potential
Nielsen (Statoil)	7	-	-	-	-	-	7.2	-	Specify the limitations related to distance from shore, water depth etc used.	Table 7.2 only reports onshore potential, so the comment is not relevant to that table it seems.
Nielsen (Statoil)	7	-	-	-	-	-	7.4	-	Use of year 2002 as baseline seems a little outdated. Should at least include what has been achieved between 2002 and 2009.	We note this in the note under the table, but we must rely on available literature and, unfortunately, this is best that is available. We also wish that an updated table were available.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	-	7.6	-	The table can be skipped. It does not really offer added value other than the references themselves that (the most relevant) can be integrated into the text, to save some space.	We believe that a comprehensive listing of the learning curve literature is helpful, and therefore believe that this table should be retained.
Twidell (AMSET Centre)	7	-	-	-	-	-	-	-	"ALL. Denmark is rightly taken as a prime example for wind power; and also for efficient use of energy in buildings, solar, chp etc. But Denmark's carbon footprint has not decreased and is not less per capita than other countries starting from the same base. WHY? This report should have an explanation somewhere, otherwise there will be doubt, especially about wind power."	Data for Denmark shows that the national CO2 footprint (in per capita emission in tons) since 1986 has a decreasing trend with high annual variability. The system-level investment decisions for capacity and operation made over the past decades influence the overall emissions. The alternative system that would have been created without wind energy is undefined. Thus the relative carbon reduction is not quantifiable.
Kheshgi (ExxonMobil Research and Engineering Company)	7	-	-	-	-	-	-	-	"For Chapter 7 it would be much clearer if wind generation numbers indicated if they are nameplate capacity or if they are delivered electricity. I assume that all numbers are nameplate unless it is stated as electricity delivered."	We believe this is clear throughout: MW vs. MWh, but we will check one more time. May be especially relevant when discussing penetration numbers, and % numbers.
Kheshgi (ExxonMobil Research and Engineering Company)	7	-	-	-	-	-	-	-	"Suggest that the section of technical resource potential be compressed to help reduce chapter length. If resource potential is not a primary barrier to wind, then a short clear assessment of this topic should be sufficient."	We will be reducing the text here to some degree.

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Gagnon (Hydro-Quebec)	7	-	-	-	-	-	-	-	"The archaic use of the term ""wind farm(s)"" must absolutely be replaced by ""wind power plant(s)"" throughout the text, conforming to standard nomenclature. Utilities can not integrate farms."	agreed
Hegde (Suzlon Energy Ltd)	7	-	-	-	-	-	-	-	"This chapter makes an excellent attempt to provide a very up to date picture on the current status of wind energy across the globe, some of the changes that I believe will strengthen the report even further are as follows - The chapter is heavily building on European case studies. Off late, US & Asian have become major markets bringing a structural change in the wind industry. By the time the report goes public, China could be a huge force to reckon with, dominating in both the manufacturing & marketshare of the wind industry. So it would be useful to have some factoring of these developments into the overall report. Similarly, the chapter can be made less word intensive avoiding duplications and less relevant details."	We do intend to include 2009 numbers as they become available, which contain an increased focus on China and the US. We will also continue to seek additional literature from non-US and non-EU sources. We are also seeking additional references in certain areas from China in particular.
Gagnon (Hydro-Quebec)	7	-	-	-	-	-	-	-	"When referring to an asset or facility, ""wind project(s)"" should preferably be replaced with ""wind power plant(s)"" wherever possible."	agreed
Kammen (University of California, Berkeley)	7	-	-	-	-	-	-	-	A new section is recommended, 7.3.2.3, on high-altitude wind energy systems. There has been considerable recent analysis of high-energy wind energy potential, as well as costs, issues, and risks in effort to access this potentially near-baseload source. Both land-tethered and ocean-tethered designs are under design and prototype. This is worth discussion in the chapter, particularly because the potential for high-altitude wind is not only a function of its infrastructure needs and costs, but on the positive side because of its potential to be a baseload energy provider (i.e. capacity factors forecast > 70%).	We have addressed high altitude wind in the text box. Additional text will be included referencing the "other" possible applications for wind in the potential deployment section at the end, to tie the text together. We do not have space to address this or other less-developed applications of wind in more technical detail in the body of the chapter, but will continue to look for additional citations to include.
Philibert (International Energy Agency)	7	-	-	-	-	-	-	-	A very good comprehensive draft already, and your reviewer has no particular suggestion to make relative to how shorten this text. Quite to the contrary, your reviewer would suggest expanding a little bit the content of Box 7.1, in particular the use of wind for marine propulsion and the future of high-sky wind technologies, which need to be supported now with public R&D expenses.	We believe the coverage of these emerging technologies for wind energy are sufficiently covered in Textbox 7.1, given severe space constraints. We will seek to add a bit more information on the potential for these sources in the Potential Deployment section.
P?lv?lgyi (Budapest University of Technology and Economics)	7	-	-	-	-	-	-	-	Consideration of hydrogen production by wind power (as an emerging non-grid connected application) is missing. There are a number of pilot investments, R&D projects both in EU and U.S. which provide useful information to assess the performance of wind-hydrogen technology.	Hydrogen is a storage technology. It is not a near-term integration issue, and therefore has generally been considered in the purview of the integration chapter. Hydrogen production by electricity could be accomplished from a variety of sources, not just wind, so is something to cover in the integrative chapters.
Nielsen (Statoil)	7	-	-	-	-	-	-	-	I think the two attached reports from ISSC ocean energy committee may be worth considering during the revision of chapter 7: SRREN_Draft1_Review_Nielsen_FinnG_Material02.pdf, SRREN_Draft1_Review_Nielsen_FinnG_Material03.pdf	We will review these materials and decide whether they should be included in the report
de Haan (Ernst Basler + Partner AG)	7	-	-	-	-	-	-	-	No comments from this expert to chapter 7 wind energy	Not an actionable comment for the wind chapter

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Twidell (AMSET Centre)	7	-	-	-	-	-	-	-	NOTE Nothing seems to have been explained about rotors needing to operate at constant tip-speed ratio. This explains why small rotors rotate fast, and large slow, which in turn has importance for visual impact. Tip-speed ratio is effectively the cotan of the angle of attack on the blades, which needs to be constant for optimum energy extraction.	We will add text to describe the current rotational speed of wind turbines today (about 10 rpm) relative to the turbines of the 1980s (about 60 rpm) in the section discussing historical technology development - 7.3.2.1.
Rabl (Vision & Results)	7	-	-	-	-	-	-	-	Some of the discussion about integration into the power system should be moved into Chapter 8.	Ongoing discussions continue on relevant location for integration material. The Wind chapter addresses near to medium term issues with the integration chapter covering longer-term issues.
SCOWCROFT (EURELECTRIC)	7	-	-	-	-	-	-	-	The chapter can be improved by introducing a framework for how to regard the fossil consequences of a high penetration of wind power, because of the need for balancing power. It could include a discussion on the trade-offs between finding the most environment-friendly and economically efficient use of resources (land etc) vs developing wind where the best support schemes are.	Much of this discussion must naturally go into the integration chapter. We do address the emissions implications of variability in one section. We may note that high-wind scenarios are consistent with a reduction in baseload generation, an increase in flexible generation, and an overall increase in aggregate nameplate capacity of the system. This chapter presents the existing knowledge base for wind technology and does not seek to make judgements regarding the many possible trade-offs that could be made based on considerations other than economic cost. Nonetheless, we will seek to address these issues to some degree, and will include a statement noting that, today, wind projects are sited in part based on policy drivers.
Smith (PNNL)	7	-	-	-	-	-	-	-	Well written chapter.	Not an actionable comment for the wind chapter
Kheshgi (ExxonMobil Research and Engineering Company)	7	-	-	-	-	-	7.23	-	"This unpublished figure by the chapter CLA on capacity factor does not agree with the published capacity factor estimates of Boccoard (2009) referenced in the chapter. Is capacity factor over 30% as in the figure or is it 25.7% as given by Boccoard (2009)? A clear assessment of the issues involved in these capacity estimates would be useful."	The Boccoard paper unfortunately has not interpreted US capacity factor data correctly. The data provided in the IPCC chapter are accurate, and are based on publicly available and verified EIA and FERC data.
Nielsen (Statoil)	7	-	-	-	-	7.9.2	-	-	It is not obvious in this chapter if in the energy discussion refers to electrical energy or the equivalent amount of fossil fuel energy to produce the same amount of electricity.	The entire report needs to be consistent on this basis, and provide that clarity in the introduction. We provide that information in the technical potential section, but more information on this should be provided in the introduction, such that it need not be repeated in every chapter.
Luderer (Potsdam Institute for Climate Impact Research)	7	-	-	-	-	7.2.1	-	-	"This section reviews the available literature on technical wind resource potential. The authors state ""that many of the studies reported in Table 7.1 may understate the technically exploitable global wind resource"" (p. 11, l. 15-16). However, none of the studies the assessment is based on, seem to have considered the thermo-dynamic limits to momentum extraction from the atmospheric boundary layer. Recent research suggests that the rate of generation of kinetic energy in the atmosphere will be affected by momentum extraction in the boundary layer, thus undermining the overall potential (Axel Kleidon, MPI Biogeochemistry, personal communication). Unfortunately, these results are not yet published in the peer-reviewed literature. Nonetheless the notion of thermo-dynamic limits should be added as a caveat here."	A fundamental limit of momentum transfer into the atmosphere exists; due to the lack of comprehensive studies estimating this value, it cannot be presented in the paper. However a caveat will be added to indicate that this physical limit exists.

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Raturi (The university of South Pacific)	7	-	-	-	-	7.2.1	-	-	ASTAE (World Bank) has recently (2009) brought out Wind Resource map for the Pacific Islands region	We will review citation and consider for inclusion
Veers (Sandia National Laboratories)	7	-	-	-	-	7.2.1	-	-	Comment on how the scale of fig. 7b does not allow the identification of major resource areas in local terrain such as the California wind developments in Altamont, Tehachapi, and San Grogonia - none of which even show up on those maps - rather California looks like is has no resource.	While this is true, it is true of any global map of local phenomena, so need not be explicitly noted in our view.
Milborrow ((Sole proprietor)	7	-	-	-	-	7.2.1	-	-	given that the resource potential is very large, but difficult to estimate accurately, could this section be shortened to save space?	We are considering ways to reduce the length of the text in this section without significantly reducing content. The summary of resource potential estimates based on literature review is a valuable contribution. Despite the inherent uncertainty in such studies, the information contained is essential for the report and for the reader in order to provide context and comparison to other renewable resource potentials.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.2.1	-	-	The section is too long, entering to many methodological details that the mean reader cannot follow. I suggest that the authors reduce the near-4 pages text to 3 pages, addressing directly the range of the resource estimated in the different studies (refs can be maintained but not thoroughly analysed) and commenting in brief what makes the range that wide. Also, please try to use one single unit (TWh/yr for instance) and skip methodological details during transformation of units.	This text will be shortened somewhat.
Kiviluoma (VTT Technical Research Centre of Finland)	7	-	-	-	-	7.2.1	-	-	Theoretical, technical and economical potentials are difficult to define. However, my understanding would be that theoretical potential would present figures of the total wind resource potential on earth - no matter the height or location. None of the estimates try to do this. Technical potential should limit the potential to the technology either currently available or estimated to be available at certain date. This should not yet have any constraints of economical or social nature. Since all the presented resource estimates try to be more realistic, at least in some way, they have constraints of this nature (Lu et al: cf 20%, Archer & Jacobsson: Class 3, Hoogwijk et al: \$0,18/kWh and land-use). Hence, all of them try to show a technical potential with at least some of the constraints of economical, ecological and/or social nature.	The SRREN glossary defines these terms; we will link our discussion to that glossary; we may also include a note in the relevant table to define the terms for our purpose
Veers (Sandia National Laboratories)	7	-	-	-	-	7.2.1	-	-	This section should deal with global resource assessments being promoted by Nate Lewis and others that rely on average global energy transport models that result in orders of magnitude lower estimates. The global rates are from references in Keith et al. (2004).	We will search the literature for the Lewis citation, and decide whether and how to address it.
Kiviluoma (VTT Technical Research Centre of Finland)	7	-	-	-	-	7.2.1	-	-	While the off-shore resource estimates do have constraints that could be surpassed in the future, I think the resource estimates show that the on-shore resource is more relevant at least to the near-mid term development of wind power. Off-shore resource is limited in comparison to onshore resource, if the distance from shore can't be too high or the water too deep. The cost of very long distance onshore HVDC transmission is not prohibitive, although it could be very difficult to get the lines built, especially if crossing borders. This relative difference in the onshore-offshore resource should be brought forth in the chapter, maybe in the paragraph about offshore resources.	This is true on a global basis, but certain regions are likely to rely increasingly on offshore. We have presented the data that demonstrate that the size of the offshore resource is much smaller than the onshore resource, and do not feel it is appropriate to translate that into a prediction about the rate of growth in onshore and offshore. The potential deployment section addresses the on- and off-shore mix on a longer term forecasted basis.

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Milborrow ((Sole proprietor))	7	-	-	-	-	7.2.2	-	-	given that the resource potential is very large, but difficult to estimate accurately, could this section be shortened to save space?	We are considering ways to reduce the length of the text in this section without significantly reducing content. The summary of resource potential estimates based on literature review is a valuable contribution. Despite the inherent uncertainty in such studies, the information contained is essential for the report and for the reader in order to provide context and comparison to other renewable resource potentials. Nonetheless, This text will be shortened somewhat.
Nielsen (Statoil)	7	-	-	-	-	7.3.2.2	-	-	It is claimed that offshore wind shear is less than onshore. This is right at some height above sea level, but not very close to the sea.	we will clarify the text
Paredes (Inter-American Development Bank)	7	-	-	-	-	7.3.3.	-	-	Standards like MEASNET should be worth being mentioned here, as an acknowledged standard for wind speed measurement and anemometer calibration, also MEASNET's efforts in standardizing wind resource assessment reports and methods.	This is a level of detail this seems unnecessary for this audience
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	-	-	-	-	7.4.4	-	-	"I suggest this title: ""Barriers and the impacts of policies"" "	All of the technology chapter have agreed to the present title, so it cannot be changed, though the recommendation is not a poor one.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.4.4	-	-	"In that Section we cannot miss some discussion regarding the European (2007) ""Energy Package"" addressing the 20-20-20 targets for 2020, including the 20% binding RES penetration target in the EU Energy System. Since wind energy will be a major contributor to RES electricity, these targets are expect to launch major developments within Europe, including a big push on offshore wind and its needed infrastructure. Also, wind combating climate change has to be addressed (also in its economic dimension). Talking just for economic incentives for wind, without explaining the policy drivers for that, might be misleading."	We will include the EU targets in the text in the wind chapter. However, it is outside the scope of the wind chapter to discuss the carbon-based motivation for wind incentives, as that should be covered in the Introductory chapter.
Veers (Sandia National Laboratories)	7	-	-	-	-	7.4.4	-	-	This section is often too vague to be useful. There are good lists in the first and third paragraph, but the mentions issues without providing much in the way of understanding.	We were restricted, by agreement, to 1 page of text. The policy chapter provides greater detail on policy measures, and that section should be reviewed for more detail.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.5.3.3	-	-	Please avoid too many references to Chapter 8 making a clear distinction of what is presented where	We will try to make this more clear, and only once, but this remains an ongoing issue for which perfect resolution may not be feasible.
Veers (Sandia National Laboratories)	7	-	-	-	-	7.5.3.3	-	-	The last paragraph is somewhat redundant with earlier material.	We will review text and alter as needed
Milborrow ((Sole proprietor))	7	-	-	-	-	7.5.5	-	-	"Authors need to check that ""x% wind energy"" always means ""on an energy basis"", as some studies base % figures on a capacity basis "	We will review all penetration numbers and, at a minimum, be very clear on their meaning
Veers (Sandia National Laboratories)	7	-	-	-	-	7.5.5	-	-	This section has too many numbers and details to be readable - it is just confusing.	We are considering ways to reduce the length of the text in this section without significantly reducing content.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	-	-	-	-	7.5.5	-	-	This section is too long and can be summarized.	We are considering ways to reduce the length of the text in this section without significantly reducing content.

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Veers (Sandia National Laboratories)	7	-	-	-	-	7.6.1.3	-	-	Is this section redundant with 7.5.5? It appears to take a different angle on essentially the same information. Perhaps they could be combined and shortened.	Environmental impacts on variability are not dealt with in Section 7.5.5. This section is therefore not redundant. We will consider adding a reference in 7.5.5 to direct the reader to section 7.6.1.3 for coverage of this topic.
Kiviluoma (VTT Technical Research Centre of Finland)	7	-	-	-	-	7.6.1.4	-	-	The net environmental benefits are net benefits only from the perspective of separate power generation projects. However, the characteristics of the generation built will affect what else is worthwhile to use and build in the power system as assumed in the All Island Grid Study described in page 38 line 25 onwards. The actual net benefit is very difficult to quantify as it will be very much influenced by future (comparative costs of generation technologies and policy measures).	This point is an excellent one, and is already addressed in 7.6.1.1. We do not feel that it is needed to reiterate that point again in detail in this section, but we will seek to reference the issue to a lesser degree.

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Bevanger (Norwegian Institute for Nature Research (NINA))	7	-	-	-	-	7.6.2	-	-	<p>The APWRA and Smøla case studies, together with a steadily increasing number of others, illustrates that wind-power development may have serious negative environmental impacts. It is an urgent need for increased knowledge on mitigating measures together with long-term monitoring of e.g. species-specific population responses. Guidelines for appropriate environmental impact assessments and best practice must be refined and deployed in connection to future wind-power plant constructions world-wide.</p> <p>Offshore wind turbines and turbines arranged along wind-exposed coastlines may conflict with the feeding and wintering grounds and migratory routes of huge numbers of seabirds and coastal birds. These birds, resident as well as migratory, use the marine environment as a source of food, at the same time being dependent on land for nesting purposes. Moreover, numerous marine and coastal species, including sea mammals and fish, are affected. Offshore systems also have an onshore connection, and include some of the on-shore challenges related to transmission, road building and construction sites. Secondary impacts of wind-power plants, e.g. power lines, known to kill a huge number of birds world-wide (due to collisions and electrocution), is not considered neither in 7.6.2.1 nor 7.6.2.2.</p> <p>The knowledge on species-specific behavioural patterns within the wind power installation perimeter at different seasons, and under different light and weather conditions, is in general poor, not only regarding bird mortality but in particular with respect to displacement and barrier effects. Chapter 7.6.2.1 stress that bird mortality caused by wind farms is to be neglected compared to the mortality inflicted by other anthropogenic sources like cars, cats, windows etc. (referring to Erickson et al. (2005), which are estimated to an annual loss of 500 million to over 1 billion birds. This is a highly inadequate comparison from an ecological point of view. All types of man-induced mortality should be assessed from the fact that these mortalities are highly species- and site-specific, as well as seasonal- and structure-specific. To compare the death of e.g. 10 000 passerines with 10 000 raptors make no sense. The impact at the population level is always the core question, although it is frequently not mentioned or understood by non-biologists. The potential impact of wind-power plants as well as other man-induced mortality, should be considered as an additional stressor on bird populations, of which several are dwindling and at risk. The issue of cumulative effects must not be ignored. Unfortunately several red-listed species are among the victims associated with wind-power production. Steadily increasing environmental stress has made mortality factors important that once were considered insignificant. Healthy populations can normally compensate for additional mortality deriving from unusual causes but may be seriously affected when these act on a reduced population.</p>	We believe that some secondary effects, such as dedicated power lines, are sometimes included in wind project environmental assessments. We also believe that it is helpful to put wind-specific bird mortality in a broader context. We do state that these impacts are highly site-specific. We will add some additional text in the spirit of the comments, however, in making it clear that these simple comparisons are suspect given the concerns of the reviewer.

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Bevanger (Norwegian Institute for Nature Research (NINA))	7	-	-	-	-	7.6.2	-	-	<p>The chapter is not up-to date regarding the present knowledge on the diversity of ecological impacts wind-power plants may have, e.g. on birds, and should be rewritten. Unfortunately the overall impression is that the author tries to de-emphasize the negative ecological impact wind-power plants may have.</p> <p>The author mainly refers to a NRC report and US-experiences, though without referring to e.g. Smallwood, K.S. & Thelander, C. (2008). Bird Mortality in the Altamont Pass Wind Resource Area, California. Journal of Wildlife Management 72(1):215-223. Their estimate of an annual loss of 11 520 birds at Altamont Pass Wind Resource Area, California, is significant. One of their conclusions is that "Given the magnitude of our mortality estimates, regulatory agencies and the public should decide whether to enforce laws intended to protect species killed by APWRA wind turbines, and given the imprecision of our estimates, directed research is needed of sources of error and bias for use in studies of bird collisions wherever wind farms are developed".</p> <p>In 2009 the Standing Committee of the Bern Convention examined the wind-power plant on Smøla, Norway (Recommendation No. 144 (2009) of the Standing Committee, examined on 26 November). (https://wcd.coe.int/ViewDoc.jsp?Ref=Rec(2009)144&Language=lanEnglish&Ver=original&Site=COE&BackColorInternet=DBDCF2&BackColorIntranet=FDC864&BackColorLogged=FDC864). One of the recommendations made was: "Accept the need for imposing mitigation measures in order to reduce the detrimental impact of the existing Smøla wind farm on birds (especially White-tailed Eagles), such as shutting down (some of) the turbines in crucial periods of the annual bird cycle (pair formation, reproduction, fledging, migration) or in periods of adverse weather conditions, taking into account the recommendations of the NINA research programme on Smøla; also envisage further reduction of mortality caused by power-lines".</p>	We will review the suggested literature for inclusion, and the text for emphasis. We believe that section 7.6.5 does address the mitigation measures associated with planning and siting.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	-	-	-	-	7.6.3.2	-	-	This section is too weak and the analysis too shallow for one of the major concerns of wind energy as stated later in lines 8 and 9 of page 47.	We will consider additional literature. We will also expand the section to include detail and analysis with the consideration of space constraints overall for the chapter.
Milborrow ((Sole proprietor))	7	-	-	-	-	7.6.3.3	-	-	"Mention that ambient wind noise can mask wind turbine noise? Note that in some jurisdictions wind turbine noise must not exceed ambient noise by a specified amount; in others absolute levels are specified."	The section on sound will be revised going into the SOD
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.7.3	-	-	This section can be shortened by half to one page, without sacrificing essential information	This entire section will be shortened to some degree.
Kheshgi (ExxonMobil Research and Engineering Company)	7	-	-	-	-	7.7.3.3	-	-	"No literature is assessed in this section, therefore, suggest deleting this section. If literature is assessed, then suggest including estimates of how large is current energy loss in wind systems."	More citations will be added, and the section retained; Due to space constraints, we will probably shorten this section of the report.
Twidell (AMSET Centre)	7	-	-	-	-	7.7.3.3	-	-	Has the need for blade cleaning been included in this section?	Section authors will consider this comment, and include text as necessary
Kheshgi (ExxonMobil Research and Engineering Company)	7	-	-	-	-	7.7.3.6	-	-	"No literature is assessed in this section, therefore, suggest deleting this section."	More citations will be added, and the section retained; Due to space constraints, we will probably shorten this section of the report.

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Nielsen (Statoil)	7	-	-	-	-	7.7.3.6	-	-	In the discussion of 2-bladed rotors offshore, easy of installation should also be mentioned.	Accepted
Nielsen (Statoil)	7	-	-	-	-	7.7.4	-	-	This chapter has main focus on the wind turbine. As offshore wind power becomes of increased importance, the importance of proper modelling of wave load, e.g. steep and breaking waves hitting the foundation, should be addressed more clearly. Also all challenges related to access to offshore wind turbines must more clearly be addressed. Here are issues related to waves, vessel motions, motion compensation, and safety issues as well as costs key issues.	More text will be considered
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.7.4	-	-	This section can be shortened by half to one page, without sacrificing essential information (in particular at the aero- part)	This entire section will be shortened to some degree.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	-	-	-	-	7.7.4	-	-	This section is too long for this text, which is not a text book. This is not consistent with the level of details of other sections in this chapter. There is an opportunity here to reduce 3 to 4 pages.	This entire section will be shortened to some degree.
Milborrow ((Sole proprietor))	7	-	-	-	-	7.7.4.2	-	-	"might it be more logical to switch the order with 7.7.4.1? Could both sections be shortened in the interests of saving space? These are highly specialised topics; unlikely to be of interest to many."	This entire section will be shortened to some degree.
Veers (Sandia National Laboratories)	7	-	-	-	-	7.7.4.6	-	-	Could comment on the gap in atmospheric science knowledge in the critical range of wind resource in the range between 50m and 200m above ground. (Schreck et al. 2008)	Accepted
Kheshgi (ExxonMobil Research and Engineering Company)	7	-	-	-	-	7.8.1	-	-	"The added cost to increase system flexibility so that intermittent wind power can be utilized is an additional cost factor that is missed in this section. Suggest including this cost factor, or explicitly stating that it is excluded whenever citing aggregate costs. Page 39 lines 1-11 posits an estimate of these costs."	We will note that these cost factors are NOT included in this section, but are addressed in the earlier integration section, so that it is clear to the reader that these costs are important, even if not included here,
Nielsen (Statoil)	7	-	-	-	-	7.8.2.3	-	-	Include more on trends in O&M and access for offshore turbines.	It is too early to identify clear trends in O&M costs for offshore wind technology beyond what has already been described; We will continue to look for available literature, but are not immediately aware of additional historical data on these points that are not already noted, especially for offshore wind energy. Current cost discussion will be expanded or reinforced to indicate why offshore O&M costs are higher.
Chaviaropoulos (Centre for Renewable Energy Sources and Saving)	7	-	-	-	-	7.8.3	-	-	Section 7.8.2 and 7.8.3 (they have similar sub-sections) could be merged in an attempt to save some space	It is important to separate historical, current, and future trends, and that is how the chapter is now organized. We are not inclined to organize the text differently.
Blanco (Universidad Nacional del Centro de la Provincia de Buenos Aires)	7	-	-	-	-	7.8.3.2	-	-	Move this section right before section 7.8.3.4	We will consider this reordering for this section and the one on historical costs as well
Nielsen (Statoil)	7	-	-	-	-	7.8.4	-	-	In the discussion of costs it must be stated how inflation is accounted for.	This is clearly noted in the introduction to the entire report, and all cost data are in real 2005\$, as noted elsewhere in the report. As such, there is little need to repeat this information in each and every chapter.

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Kheshgi (ExxonMobil Research and Engineering Company)	7	-	-	-	-	7.8.4.1	-	-	"Learning curves are only one (simplistic) model for technology cost reduction and it would help to put it in the context of all factors that can contribute to cost reduction. For wind, increased turbine size has played a key role in cost reduction that is not related to learning but rather to scale-up."	We already note the many reasons that learning curves can be misleading, but will review the text to see if upscaling, R&D, and other factors are missing. This is also one of the reasons that we discuss engineering based estimates of future cost reduction potential.
Veers (Sandia National Laboratories)	7	-	-	-	-	7.8.4.2	-	-	The DOE 2008 estimate of 10% cost decline is dominated by the learning curve effect (see table 7.4). The 15% estimate of energy production increase is an engineering model result.	We will review text for possible revisions.
Nielsen (Statoil)	7	-	-	-	-	7.8.4.3	-	-	In teh projected cost of energy one should, in particular for offshore projects, also account for the effect of higher production per year due to higher availability.	We believe that the reviewer is referring to capacity factor rather than availability. We believe that we have captured the inherently higher energy production from offshore wind by estimated a generally higher capacity factor range.
Kiviluoma (VTT Technical Research Centre of Finland)	7	-	-	-	-	7.8.4.3.	-	-	How is the cost reduction range suggested by the cited literature? U.S. DOE 2008 (seemingly the best engineering estimate) has much higher expected cost reduction: +45 annual energy production and -10% capital cost compared to a 2002 turbine (around \$1400/kW according to figure 7.22).	We will try to clarify this, but the note at the bottom of Table 7.4 addresses the discrepancy, which is related to a 2002 turbine start year in the table, while the later cost reduction numbers use a 2008 start year