About the SAIGUP and model setup

"*The first four papers all suffer from a significant presentational defect that the SAIGUP static model .... are treated as opaque 'black-boxes', which the reader is not able to evaluate or even able to reproduce based on the provided information*".

Your revised introduction answers, to a large extent, these questions. However, I suggest that you add a few extra sentences that EXPLICITLY state that a special issue of the Petroleum Geosciences is devoted to the SAIGUP study.
Moreover, you should also state that one realization of the SAIGUP models is available for download:
http://www.sintef.no/Projectweb/MRST/Downloadable-Resources/Download-SAIGUP-Data-Set/
and that this model is used as an example in MRST, see:
http://www.sintef.no/Projectweb/MRST/Tutorials/Realistic-Reservoir-Model-II/
Maybe, we could also set up a simulation with MRST and publish it on our webpages if you send me an ECLIPSE input file.
>> A new paragraph is added to the end of Section 1.5 referring to the paper, and downloading links.

"*The SAIGUP model contains varied depositional features, .. It also has a structural dip, which is not clearly explained. Some cartoons of this are provided, but no proper cross-sections .... The native grid resolution .. is not stated, nor what degree of upscaling was required ...*"

I think that your revised introduction answers most of these questions. However, I could not find the number of grid cells stated explicitly; you should do this.
Moreover, I think that the brief discussion of upscaling on page 10 should be extended to refer to the appropriate SAIGUP paper that discusses upscaling.

>> Table 1.1 and a paragraph with reference citation are added in Section 1.5.2.

"*It is not made clear what the grid structure of the reservoir flow model is until Paper V (Table 1). The size of the model is also a cause for concern (...).* "

I do not see that you really address the concerns raised by the committee in Section 1.9.2. These are important objections that should be stated and discussed.

>> The starting part of Section 1.9.2 is rewritten to address the mentioned concern.

"*The model outputs depend crucially on the detailed interaction (..).*
Surprisingly, however, only one injection well location or well completion is tested, so we do not get any feel for how robust the results are with respect to well position and injection strategy (..)".

You did test several well locations, did you not? I do not recall why we did not include any such results. If you have no such results available, I think you at least should include a discussion of in Section 2 and in Paper III, but preferably try to run a few numerical experiments that can be included.

>> A paragraph is added in the end of comments on Paper III to address this (the second last paragraph).

"*A similar argument can be extended to the leakage risk scenarios. (..) Moving the central leakage point with respect to depositional lobes or fault locations might radically change the outputs.*"

This is a valid point, but would (as far as I understand) involve a huge amount of work if to be investigated for many representative realizations. I think you should raise this question at the end of Section 2 and explain that the main point of your thesis was to demonstrate the huge variation that can be observed even with a single fixed injection point. (However, if you have time, it would of course be good to include a few experiments).

>> A paragraph is added in the end of comments on Paper III to address this.

About ECLIPSE and flow equations

"*A substantial section then follows on the theoretical basis for flow in porous media ....; it is difficult to see what it really adds to the rest of the Thesis, because the modelling actually uses the proprietary ECLIPSE flow simulator that is essentially treated as a black-box. Information on the implemented boundary conditions and selected input parameters is given, yet hardly an adequate description on the ECLIPSE mode setup or specific options and keywords used in the simulation of CO2 storage*"

I suggest that you start Section 1.6 by stating very explicitly that you (in the following) will go through the standard flow models as used in the commercial reservoir simulator you use (ECLIPSE). You should also consider adding a subsection in which you present selected parts of the ECLIPSE input file(s) (show excerpts of a file in small font) and discuss the setting of salient options and keywords.
>> A sentence is added to the beginning of Section 1.6.
>> A sample of ECLIPE data file is added under a new Subsection 1.9.4

"*It is not stated which simulator version E100 or E300, and which specific options were employed in the simulations*"

You definitely need to state which version of ECLIPSE that you are using. (This may sometimes be tricky in papers because of restrictions on the use of trademarks, but is usually overcome by referring to the appropriate user manual).
>> Now it is more than once mentioned that black-oil ECLIPSE is used. Also the ECLIPSE input file is explained in detail.

"*A short section on vertical averaging is interesting and quite clear, but again does not seem to be relevant (...)*"

Actually, I was thinking the same when I reread the introduction. Maybe you should just remove this section, unless you have a good explanation of why it is needed.

>> It is part of a general introduction to CO2 sequestration, as I have talked about diffusion-convection in long term migration as well. In addition, there is a reference to the paper I have contributed to.

About the papers, conclusion, etc.

"*Papers I and II are outlines of conference presentations based on preliminary modelling and analysis. They are not well written, with exceptionally poorly labelled and captioned diagrams and very rudimentary explanations of the results*".

I suggest that we discuss with Jan whether these papers should be moved to an appendix.
>> I would totally agree with this idea.

"*More generally, it is difficult to assess the degree to which the results will have wider generic application or are model-specific. In particular it is difficult to assess how robust the results are and to what degree model deficiencies (size of model, boundary conditions, internal grid resolution) are influencing the results - our intuitive feeling is that model artifacts are significant*"

This is a key point which I tried to comment on the last page I sent you. I think you should try to relate your work more closely to what was done in the IGEMS study and comment more on observations made by other members of the MatMoRA team on the effect of top-surface morphology (papers by Halvor et al, Sarah et al, ...).
>> The Section 1.11 is extended to cover this issue.

"*We do have concerns in assessing how much of this work the Candidate carried out himself (...).*"

You could state your contribution at the beginning or end of the comments that follow the summary of each paper in Section 2.
>> Done. Please let me know if this is good or need to be modified.

"*Analysis of the outputs should properly take into account deficiencies in the model and should unravel those outcomes which are model artefacts from those results which arise from realistic processes and might have generic application*"

This is a valid point that you should think carefully through. I am not sure at the moment how to answer this.
>> The Section 1.11 is extended to cover this issue.

"*In a Discussion section, the Candidate needs to think carefully about how this type of modelling could be used in a real storage situation, needs to discuss its general applicability and could perhaps speculate on how this concepts, with improvements, can be taken forward.*"

This is something that we have discussed earlier and which you have not yet followed up properly. When starting with a new (potential) storage site, one should do as follows:
- use the techniques from aPC to derive appropriate sample point for geological parameters
- construct geological models at these sample points
- perform flow simulations for each sample point
- construct proxy model
- perform Monte Carlo study to look at uncertainty/risk You have much of the arguments already in your thesis. You just have to connect the dots so that the reader sees the picture.

>> The Section 1.11 is extended to cover this issue.

Specific comments and issues

"*A good example of this is the result (Paper III, Figure 7), that sensitivity of reservoir pressure to the direction of progradation actually switches polarity at the end of the injection phase. This is a rather radical result that is difficult to visualize ...*"

Did you include a new discussion (and extra supporting plots) in the revised version of the paper? I don't recall having seen this.
>> The examples in the paper are designed to address this issue.

"*More specifically, the static (SAIGUP) and dynamic (ECLIPSE) models should be described in detail, including internal geological (..) architecture, 3D properties and grid geometries (..), PVT model and detailed implementation of boundary conditions*".

I think that most of this is done in the revised introduction except for PVT. If you used a black-oil model, this should be explained in more detail and you should show what relations you use.
>> The PVT data are included in the ECLIPSE code in Subsection 1.9.4.

"*Examples should be provided of plume and pressure evolution over time for a representative suite of models (..)*"

This should not be too difficult to include. You already have a few plots included in the introduction, but maybe a set of 3D visualizations of the plumes (e.g., as a 4 x 3 matrix of different cases) would more clearly show the variation in the different cases.
>> Honestly, I did not find enough time for this. I wished that the slice-plots for end of injection and end of simulations be enough for that.