Summary: 'An Actuator Sector Model for Wind Power Applications: A Parametric Study' seeks the optimal settings for minimizing Actuator Sector Model (ASM) error relative to the Actuator Line Model (ALM). Large eddy simulations for both techniques are performed alongside the Actuator Disk Model (ADM) in the Simulator fOr Wind Farm Applications (SOWFA) OpenFOAM library. Results are compared in terms of turbine body forces, power, thrust, wake structure, velocity, vorticity, and turbulence kinetic energy. Optimized ASM outperforms the ADM, especially in the near wake where the ASM recreates the majority of ALM near wake phenomena. With the correct settings, the authors report time saving of up to 75% with low relative errors near 1% across relevant quantities.

Key Points: The authors identify the ideal ASM settings to obtain high fidelity LES results for a particular case in substantially less time than with the ALM. This finding is encouraging as balancing computational expense with accuracy is an inherent limitation of all simulations. Overall the manuscript is clear although organization and layout should be improved. Several questions remain with regard to whether the optimal settings are generalizeable and their relationship to underlying ASM theory. The article is primarily concerned with comparing among simulation approaches which limits discussion on the relationship between model parameters and the relevant physics.

Recommendation: I recommend publication in *Wind Energy Science* after major revision provided the authors successfully address the comments below.

Suggestions:

1. Please consider additional grammar editing.

2. The manuscript needs to be reorganized to improve readability. Figures and tables should be located near where they are first referenced in the text and equations should immediately follow their variable definitions. Searching through the text for variable definitions or the appropriate figure detracts from the quality of the work.

3. "Number of cells along the rotor diameter" is unwieldy as a figure caption and in the text. If the goal is a qualitative comparison between grid resolutions, a naming convention like "Coarse, Medium, Fine" would be more intuitive for the reader. If a quantitative measure is important I, recommend a quantity with physical significance such as N_{cells}/D, Δx, or $\Delta x/D$.

4. The results are well presented and illustrate the impact of various settings on error relative to ALM. However, it is unclear how well they can be generalized to other scenarios without relating optimal parameter settings to underlying physics or ASM theory. For instance, the best sampling location to minimize error appears to be at 0.7 the sector width. If the inflow velocity is increased to 15 m/s, is 0.7 the sector width still the optimal sampling location? If not, is it possible to estimate the correct location from the current results or is a second parameter sweep required?

5. Line 84, please move Equation 6 to the end of this paragraph.

6. Line 100-113 and Figure 2, if these are results please move them to the results portion of the paper.

7. Table 1, why are there 5 sectors for each resolution? Shouldn't the number of sectors increase with θ following Equation 4? This may also explain why error increases with mesh resolution.

8. Line 166, how many points per line were used for each case? Did the number of points vary with mesh resolution?

9. Lines 271-285 and Equations 7-9, please move this to Section 2. Although it is relevant to the results at hand it interrupts the flow of the manuscript.