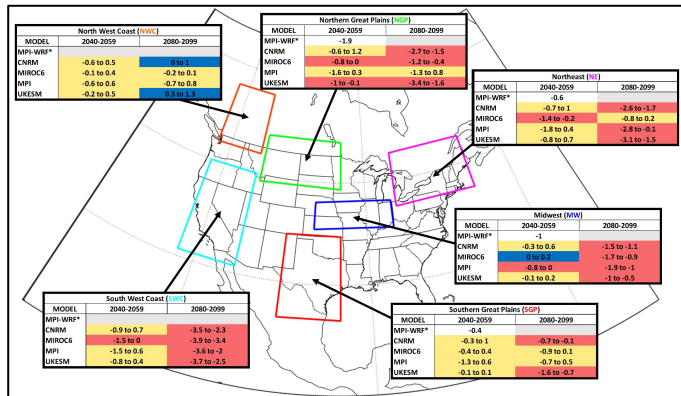


# Projecting future energy production from wind farms – Part 2



Precis of projected differences in average capacity factors (power production efficiency): future minus current at operating wind farms derived using numerical modeling (WRF-MPI) and machine learning approaches (listed in the tables by ESM to which the tool was applied). Shading denotes direction of change: Red indicates all projections are lower in future, blue that all projections are higher in the future, while yellow indicates the differences span 0.

## Scientific Achievement

New statistical downscaling method is developed and used to make high-fidelity projections of wind power generation at operating wind farms in North America. By the end C21st, electricity production is projected to decrease in many areas but may increase in parts of the Southern Great Plains. The magnitude of these changes is a strong function of the ESM and the radiative forcing applied.

## Significance and Impact

Wind energy represents 29% of total U.S. electricity generation capacity additions over the last decade with installed capacity rising to 135 GW at the end of 2021. We quantify possible changes in electricity production from wind in different regions of the US that might arise due to greenhouse gas induced climate change.

## Research Details

115 Earth System Model (ESM) realizations are downscaled to make projections of wind power electricity generation potential at operating wind farms over North America.

Coburn J.J. and Pryor S.C. (2023): Projecting future energy production from operating wind farms in North America: Part 2: Statistical downscaling. *Journal of Applied Meteorology and Climatology* 62 81-101 doi: 10.1175/JAMC-D-22-0047.1.

