Problem:

Wind energy has the potential to mitigate many problems associated with fossil fueled electrical generators. With no fuel costs, no emissions and ever-increasing reliability, wind turbine generators (WTGs) are rapidly being installed throughout the world. While benefits accrue to the users of wind energy, there are associated problems. The most significant problem is intermittency. Grid operators are tasked with generating enough electricity to match the ever-changing load throughout the grid. Due to its intermittent nature, wind energy cannot be arbitrarily dispatched from WTGs. In that sense, wind energy effectively increases the load variability, placing greater burdens on grid-operators.

Mechanical Storage System Research:

While many technologies have been suggested to help mitigate grid impact of wind systems, we approach the problem with the premise that overall efficiency is maximized if the number of energy transformations is minimized. Hence we focus on mechanical energy storage (direct from the rotor), specifically: 1) hybrid compressed air & liquid working fluids; and 2) mechanical flywheels utilizing continuously variable planetary gear trains. While we acknowledge the potential of other methods, we believe that these two methods hold the most promise because the technology required to implement them is readily available. Specifically, our current work in drive train technology is a perfect fit with both of these mechanical energy storage solutions.