The large-scale integration of renewable generation in the electric grid has created a new paradigm in the decision-making process for power systems. New algorithms must be developed to harness the full potential of these uncertain power sources. My research goal is to develop new efficient, adaptive algorithms enabling optimal use of renewables. To do so, I aim to utilize novel online learning models, a framework that has proven performance guarantees. Online convex optimization is particularly adapted to this problem because its training and decision-making processes run concurrently. Decisions can therefore be made faster and more dynamically than with an offline approach. I aim to expand the operating conditions under which performance guarantees can be established. Specifically, I want to prove sub-linear regret of Newton step algorithms when applied to stochastic loss functions. This model would improve the current online optimal power flow solutions for modern electric grids by accounting for both equal and inequal time-varying constraints.

Problem statement: The large-scale integration of renewable power sources into the modern electric power grid has created many new challenges to be solved. Renewable power sources are intrinsically intermittent in their power generation which creates uncertainty in power delivery. High performance, adaptive and reliable models for decision-making in such uncertain conditions is crucial in maximizing the potential of a renewable-powered grid. The challenge is therefore to

A solution to this problem is an online convex optimization (OCO) approach. OCO is a branch of machine learning in which training and decision-making are performed concurrently. This enables fast reaction-time and adaptability while guaranteeing performance. Previous research has

Objectives: My principal objective is to develop an online interior-point method for dynamic problems involving time-varying stochastic constraints.