Problem statement
Concerns about global warming have spurred large-scale investments in renewable energy and a voluminous literature about reaching 100% renewable energy. In their seminal paper, Wustenhagen et al. (2007) grouped hurdles to the adoption of renewables into social, community and market barriers. An important question remains when trying to diagnose market barriers in a dynamic political landscape in the US, what is the optimal generating portfolio? Without examining this question, it is difficult to say whether barriers exist.

Context and research approach
Recently we have developed a model assessing costs and profitability of different energy technologies in the CAISO and PJM markets of the US, trying to identify market barriers and supports for renewables (Wachs & Engel, In Preparation). While individual technologies vary in their attractiveness for new implementation in terms of profitability, which is a key metric as we have found, a combination of technologies is ultimately achieved. This work looks at the optimal portfolio using the theory developed by Markowitz (1952) but as extended by Black and Litterman (see (Idzorek, 2007)). Awerbuch popularized the use of portfolio theory in electricity planning (2006). Arneson et al. implemented the Black Litterman approach to look at Italian generation portfolios (2012). A recent review pointed out that literature has mostly focused on fuel prices, demand growth and CO₂ prices (Pérez Odeh, Watts, & Flores, 2018).

Results
In this work we identify optimal power generation portfolios from a social/sustainability perspective as well as a profit perspective with special attention to defining risk factors for the two perspectives. In this way we can see the differences between what appears optimal taking into account sustainability versus the perspective of investors, who we postulate are the key decisionmakers regarding energy.

Market implications
The difference between the optimal portfolios from the standpoints of investors and society is likely due to market barriers, since it reflects a lack of profitability for socially desirable outcomes. Identifying risk factors is important because the political landscape is changing rapidly. Aligning social and market preferences is key to correct planning, and it is important to provide industry potential tools to diagnose risks from a social point of view.
References