QuEST Equity: A Tool for Assessing Powerplant Replacement with ES&PV

David Rosewater, Tu Nguyen, Walker Olis, and Ray Byrne

Abstract
- Peaker plants provide power to the grid at peak times of the day and are often located in marginalized communities where their pollution has been linked with adverse health outcomes.
- A linear program is developed to optimally size a ES+PV to replace a given powerplant.
- This problem is of interest to utility resource planners wanting to weigh both economic and non-economic trade offs.

QuEST Equity provides a user friendly tool to assess the costs, benefits, and distributional impact of powerplant replacement.

Methods
- Discount rate
- Value per ton of CO2
- ES and PV cost
- Replacement factor(s)
- Analysis Horizon

Select a Power Plant
- Choose Analysis Parameters
- Choose Dispatch Type
- Confirm Inputs
- Run Optimization

Optimization Problem Formulation (Flexible Dispatch Assumption)
\[
\begin{align*}
\min_{x \in \mathbb{R}^{3n+3}} & \quad c_{MW} p_{PV} + c_{MW} p_{BESS} + c_{MW} E_{BESS} + \Pi |g| \\
\text{s.t.} & \quad \| p^+ + p^- \|_1 \leq P_{BESS} \\
& \quad p^+ - p^- \leq P_{BESS} \\
& \quad \sum p_{Plant} \geq \rho \sum p_{Plant} \forall i \in P_{peek} \\
& \quad x \in \{c, p^+, p^-, g, P_{BESS}, E_{BESS}\} \in \mathbb{R}^{3n+3} \times [0,1]^n
\end{align*}
\]

Minimize capital cost, subject to: state of energy, powerplant replacement fraction, and es power / energy limits.

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