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HOW DO DISTRIBUTION LOSSES AND DIFFERENCES IN OPERATING CHARACTERISTICS INFLUENCE MEASURED EFFICIENCY IN ELECTRICITY DISTRIBUTION?

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Overview
While it is common practice to control for operating characteristics when estimating the efficiency of electricity distribution network operators, few papers have explicitly demonstrated the impact of such factors on estimated efficient input requirements. Moreover, while electricity distribution is often modeled as a function of capital inputs and operation and maintenance expenses, distribution losses, which amount to a significant cost to distribution network operators, are seldom controlled for. This paper therefore considers these issues, and yields the conclusion that industry structures put into place to encourage competition in energy markets, may contribute to green house gas emissions by curtailing incentives to reduce distribution losses.

Methods
This paper uses a sample of 207 publicly owned US distribution network operators to estimate an input distance function model which not only includes distribution losses as an input, but also controls for differences in network operating characteristics and regional location. Furthermore, it suggests a distance theory based methodology to estimate the impact of deviation from "typical" operating characteristics on efficient input usage.

Results
The results demonstrate considerable variation across both utilities and regions with regard to the impact of exogenous operating characteristics on efficient input usage. Moreover, the results suggest that failure to control for distribution losses results in a considerable downward bias in estimated returns to scale, a relatively small upward bias in estimated net distance (inefficiency), and a considerable downward bias in the estimated impact of exogenous operating characteristics on efficient input usage.

Conclusions
These results are important for regulators because they provide a method of accounting for legitimate differences in input requirements between utilities facing different operating environments. However, they are also important for policy makers, because they suggest that if distribution and supply of electricity are vertically separated in order to allow more competition in electricity markets, and it is not possible to internalize the cost of distribution losses, there is a strong potential for socially suboptimal levels of loss reducing effort by distribution network operators. Moreover, they suggest that if policy makers wish to minimize distribution losses, and hence unnecessary greenhouse gas emissions, they will need to properly incentivize distribution network operators.