



# Economic Efficiency of Alternative Border Carbon Adjustment Schemes: A Case Study of California Carbon Pricing and the Western North American Power Market

EPRG Working Paper 2032

Cambridge Working Paper in Economics 20109

**Qingyu Xu, Benjamin F. Hobbs**

**Abstract** A local jurisdiction that regulates power plant emissions, but participates in a larger regional power market faces the issue of emissions leakage, in which local emissions decrease, but emissions associated with the imported power increase. Border carbon adjustment (BCA) schemes can be imposed on imports in an attempt to lessen leakage. This paper explores the potential cost and emission impacts of alternative BCA policies that could be implemented in the California AB32 carbon pricing system. We focus on cost and emission impacts on the power sector in California and the rest of the Western Electricity Coordinating Council (WECC) region, the latter of which provides approximately 23.5% of California's electricity requirements.

With both a simple schematic model and a detailed WECC generation-transmission expansion planning model for the year 2034 called JHSMINE, we examine the following deemed emission rate schemes for estimating and charging for emissions associated with electricity imports: no BCA, facility (import source)-specific deemed rate, a facility-neutral and constant deemed rate, and a facility-neutral and dynamic deemed rate. Our results suggest that, compared with cases with either no BCA or a BCA using facility-based deemed emission rates, facility-neutral schemes can provide efficiency gains by simultaneously lowering WECC-wide emissions and costs without raising payments by California consumers. Emissions leakage declines greatly. The precise value of the deemed rate affects these gains. One particular facility-neutral dynamic scheme in which rates are set by marginal emission rates external to California provides the greatest gain in economic efficiency. Our results also show the impact of carbon pricing and BCAs on transmission investment economics: California's unilateral AB32 carbon pricing encourages more interstate transmission expansion because power imports are more profitable; however, BCAs that are cost-effective in lowering total regional emissions will dampen those incentives.

**Keywords** Carbon policy, Border carbon adjustment, Electricity markets, Expansion planning, Market efficiency

**JEL Classification** H23 (Pollution Tax) L94 (electricity industry) Q48 (energy policy)

Contact [bhobbs@jhu.edu](mailto:bhobbs@jhu.edu)  
Publication November 2020  
Financial Support U.S. Environmental Protection Agency to Yale University, Assistance Agreement No. RD835871  
National Science Foundation, Grant 1711188  
[www.eprg.group.cam.ac.uk](http://www.eprg.group.cam.ac.uk)