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Emissions Performance Standards: An Overview

Berlin

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The Regulatory Assistance Project

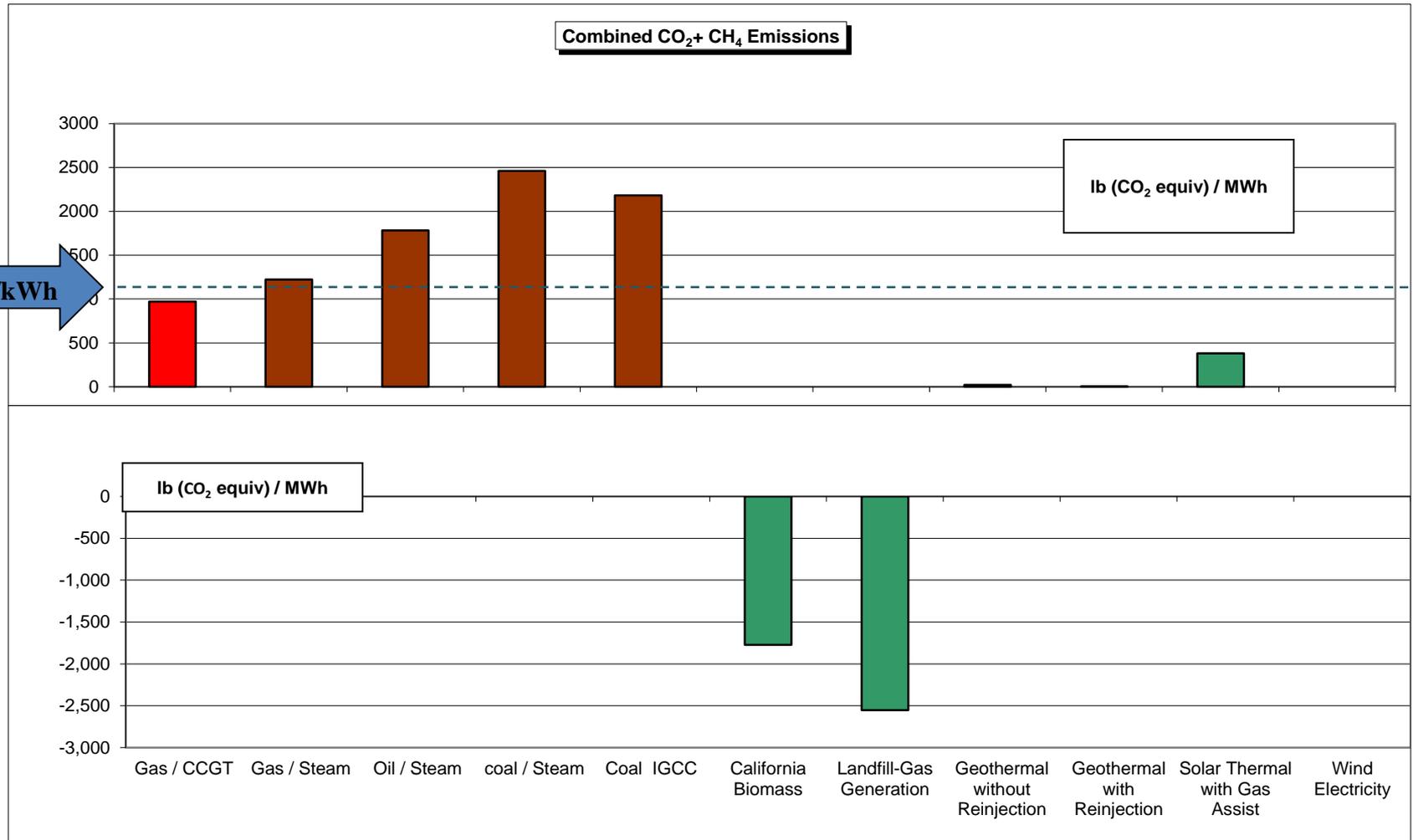
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Emissions Performance Standard

- What is an EPS?
 - An output-based requirement: it establishes a maximum level of emissions (CO₂ or CO₂e) per unit of electrical output from a power plant
 - It is technology neutral
 - Analogous to other output-based requirements: e.g., for SO₂, NO_x, PM, etc. or for industrial production (tons steel/MWh)
- Purpose
 - To drive investment in lower-emitting resources
 - To block the long-term “lock-in” of emissions from new investments in high-emitting generators
 - To drive retirement or retrofit of non-complying resources
 - To reduce risks for both consumers and investors

Representative GHG Emissions Rates



EPS Policies

- California
 - Standard: 1100 lbs CO₂/MWh (approx. 500 g CO₂/kWh): equivalent to combined cycle gas turbine (CCGT)
 - Applies to any and all long-term financial commitments with facilities that operate at capacity factor 60%+
- Washington
 - Standard: lower of (a) 1100 lbs GHG/MWh (approx. 500 gCO₂/kWh); or (b) average available GHG emissions output (of new CCGT as determined by the government, survey every 5 yrs)
 - Applies to any and all long-term financial commitments with facilities that operate at capacity factor 60%+
- Oregon
 - Standard: 1100 lbs CO₂/MWh (approx. 500 gCO₂/kWh)
 - Applies to new, long-term financial commitments (5 yrs+) to baseload facilities entered into by the utility

EPS Policies (and almost EPSs)

- Canada
 - Beginning 1 July 2015, new coal-fired electricity generation units will be required to meet an EPS of 420t/GWh (equivalent of CCGT)
 - Also applies to units that have reached the ends of their useful lives (if they want to keep operating)
- Illinois (not an EPS)
 - Starting in 2015, electric utilities in Illinois are required to acquire 5% of their supply from a “clean coal” power source
 - Target rises to 25% by 2025
 - Plants operating before 2016 qualify as clean coal as long as at least 50% of CO₂ emissions are captured and sequestered (CCS)
 - Requirement rises to 70% for coal power plants expected to commence operating in 2016 or 2017, and to 90% thereafter
- Norway (not an EPS)
 - No gas power plant can be built without CCS

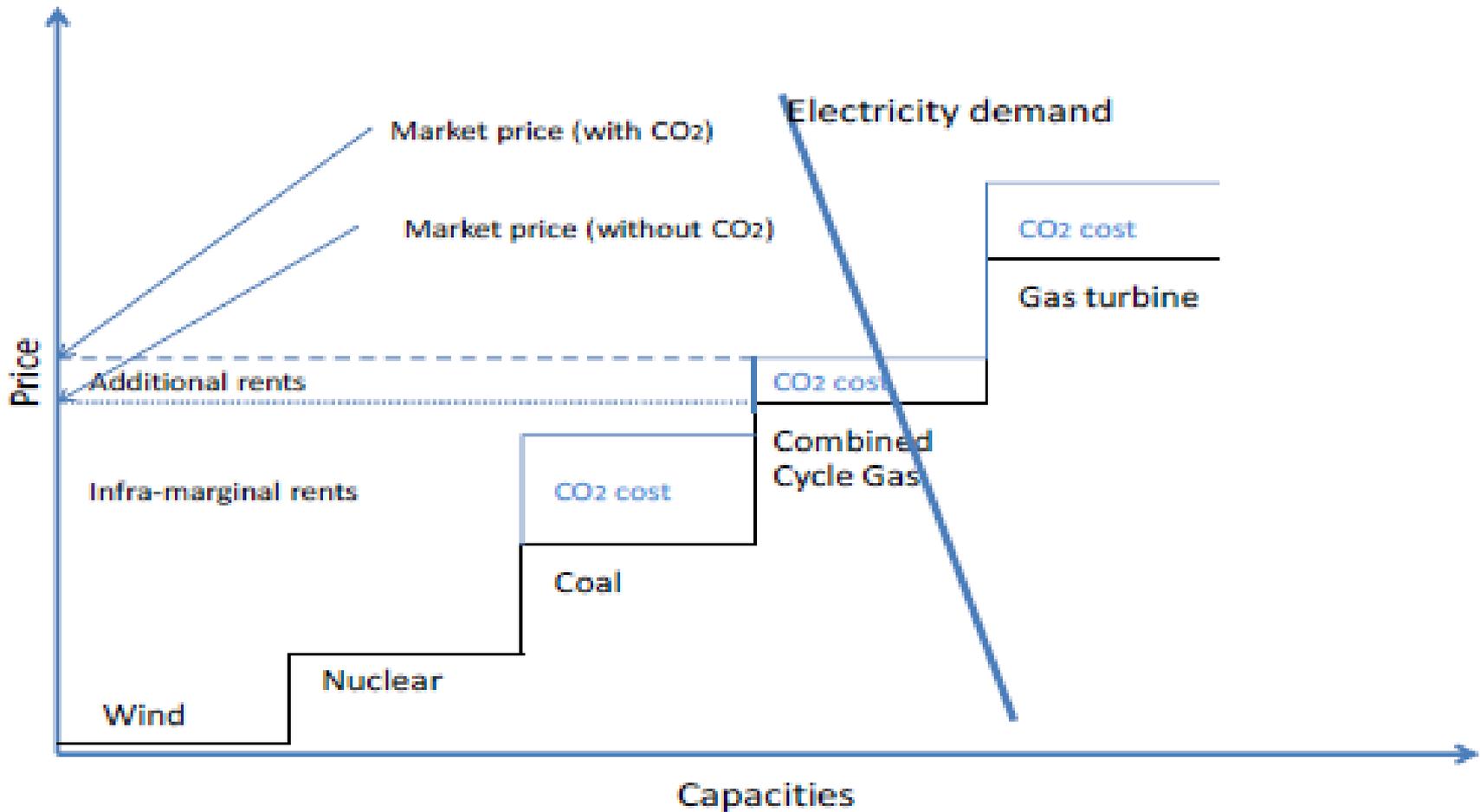
Small-Scale Generation Emissions Rule

- Model output-based emissions standards for new small-scale generators (typically distributed generation)
 - Actual range of generator capacities affected is determined by state and federal law
- Standards for five emissions: SO₂, NO_x, CO, PM, and CO₂. All standards must be met.
- Net emissions calculation for CHP
 - Emissions avoided by the use of the waste heat from electric generation for some other thermal purpose (e.g., space heating) are credited against the emissions per MWh output

China

- Output-based efficiency standards for eight industrial sectors, including electric generation
 - Fuel input per unit of output
 - For electricity, denominated in grams of coal/kWh
 - Complementary policies
 - Electricity: Forced closure of small (<100 MW) generating units
 - Other industries: Electricity price penalties for failure to meet the standards (the more inefficient you are, the higher the price you pay)

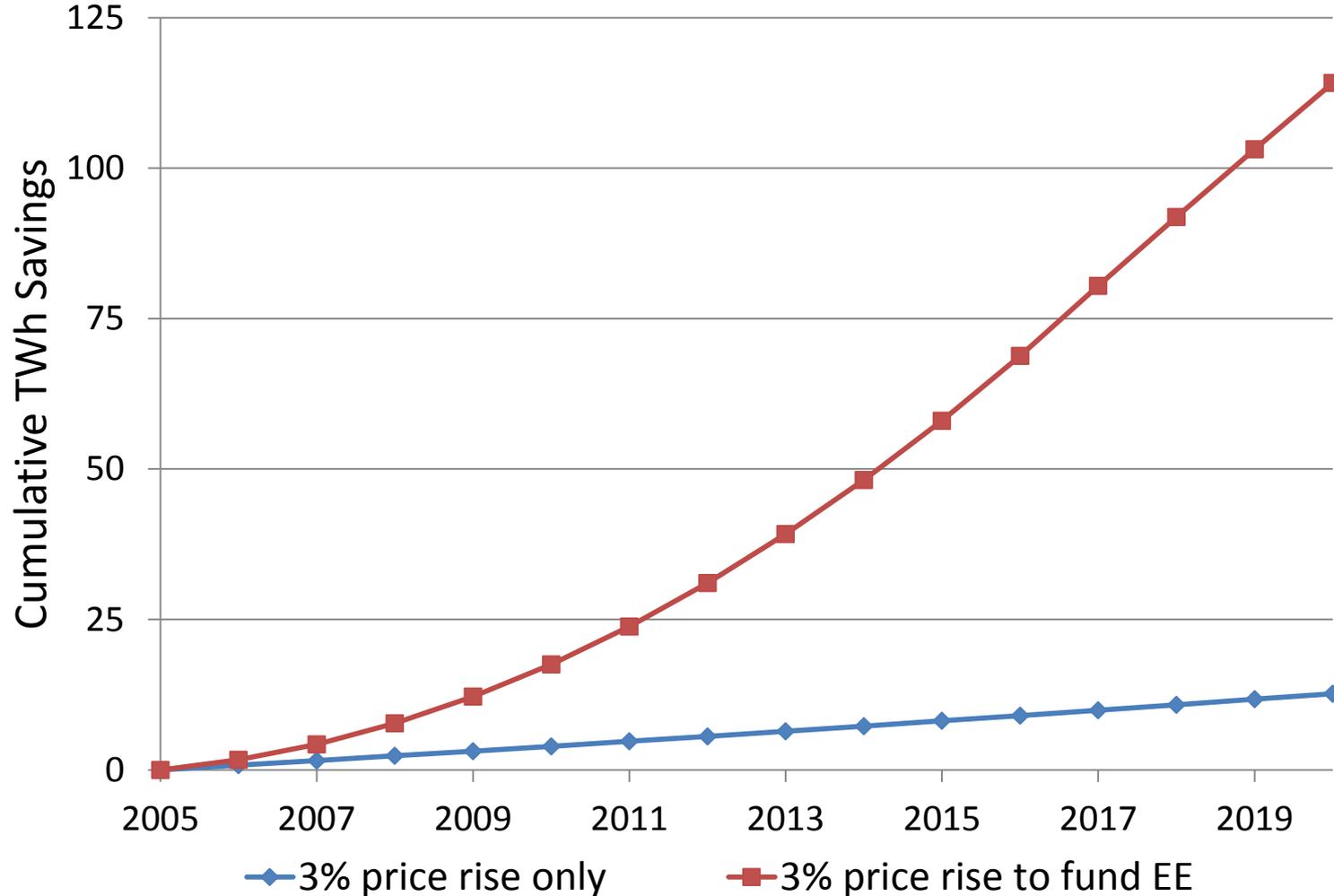
Merit Order and Increases in Price due to CO₂ Pricing



Cost of CO₂ Reductions from Carbon Pricing

- PJM Study
 - With CO₂ allowances at \$20 per ton (€15), in 2013 the “impact on the PJM Energy Market could be power price increases as high as \$15/MWh (€11), and market-wide expenditures increase by as much as \$12 billion (€9 billion), while providing emission reductions from PJM sources of approximately 14 million tons.”
 - *Potential Effects of Proposed Climate Change Policies on PJM’s Energy Market*, PJM, January 23, 2009.
 - This translates to **a cost of over \$850 (€640) per ton** of carbon dioxide reduction, or **more than 40 times the per-ton market price of the carbon allowances**.
 - Lesson: The impact on consumers *in the power market* is far higher than the marginal cost of carbon *in carbon markets*.
- Other studies have confirmed the essential findings, though the magnitude of the impact varies depending on relative energy prices
 - ECN study and the experience of the Regional Greenhouse Gas Initiative confirm that directing carbon allowance auction revenues to investment in end-use energy efficiency achieves GHG targets at significantly lower costs per ton and save end-users money.
 - *Investing EU ETS auction revenues into energy savings*, Cambridge Econometrics, May 2013, ECN-E--13-033

Investing a price rise in EE saves 9 times more electricity than that from a price rise



How is an EPS Different from an Emissions Cap?

- Emissions Cap: Reduces the overall level of emissions produced in the affected sectors (in this case, the electric sector)
- EPS: Sets minimum level of GHG emissions performance for any facility that represents a new long-term financial commitment
- Complementarity: the Push-Pull Effect
 - The EPS pushes, the ETS pulls, investment in desired direction and accelerates capital stock turnover

EU Context

- On October 7, 2008, the European Parliament voted in favor of an EPC for new power plants
- Under the proposed standard, any new electric power plant constructed after 2014, with capacity >300 MW can not emit more than 500 grams of CO₂ per kWh, on an annual average basis
 - Equivalent to California's 1100 lbsCO₂/MWh standard adopted in 2007
 - The proposal calls for the Commission to complete a review of the proposal by the end of 2014, to determine whether and how its various provisions ought to be modified

Quantitative Analysis for the EU

- ECF study for the EU found that:
 - 70% of reduction potential lies with installations >300 MW capacity
 - For scenario that includes new and existing facilities with EPS of 350 gCO₂ /kWh:
 - Reducing size threshold from 300 MW to 100 MW improves emission reductions from 25.4% to 34.3% over the whole period (2005-2030)

Implications of Alternative EPS Levels

- 500 gCO₂/kWh (1100 lbsCO₂/mWh)
 - Easily achieved by newly built natural gas plants (combined cycle gas turbines “CCGTs”)
 - Not likely to be met by older, less efficient existing gas-fired plants
 - Minimum of 30% co-firing of biomass or CCS necessary with oil, hard-coal, and lignite

Implications of Alternative EPS Levels

- 350 gCO₂/kWh
 - Can be achieved by new, efficient plants using natural gas
 - Possible exceptions for cooling technologies, smaller-sized facilities, certain geographical locations
 - Minimum of 50% co-firing of biomass or CCS necessary with oil, hard-coal, and lignite
- 150 gCO₂/kWh
 - Can only be achieved by using biomass or by combining fossil-fuel use with CCS

Some Design Considerations

- Leakage
- Investment in units of capacity <300 MW
- Upgrades (life extensions and capacity expansions) of existing plants
- Calculation of net CHP emissions
- Calculation of net biomass emissions

About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at www.raponline.org

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