



## Cap and Trade among WCI and Midwestern States

### 1. The assumptions we adopted in our simulation model are summarized as follows:

#### Geographical Configurations:

- W1: five Western States — Arizona, California, New Mexico, Oregon, and Washington
- W2: all WCI partners — Arizona, California, New Mexico, Oregon, Utah, Washington, British Columbia, and Manitoba
- W3: all WCI partners and five WCI observers — Arizona, California, New Mexico, Oregon, Utah, Washington, British Columbia, and Manitoba plus Colorado, Idaho, Montana, Nevada, and Wyoming
- M1: five Midwestern States — Iowa, Illinois, Michigan, Minnesota, and Wisconsin
- M2: seven Midwestern States — Iowa, Illinois, Michigan, Minnesota, Wisconsin, North Dakota, and South Dakota

#### Economy Wide Cap and Trade Cases:

##### Case I: Base Case Mitigation Cost:

- the simulation target year is 2020
- all sectors are included in the emission accounting and mitigation effort
- all GHG emissions are considered
- all gross emissions (excluding sinks) are considered
- all emissions are consumption-based
- emission data for WCI states (and provinces) come from CCS inventories and forecasts studies for respective states
- emission projections in 2020 for Midwestern states are calculated based on EIA regional projected emission growth rates: Iowa, Minnesota, North and South Dakotas belong to West North Central Region; Illinois, Michigan, and Wisconsin belong to East North Central Region.
- offsets are not included
- no safety valve (permit price limit) is included
- we did not include auction costs/revenues in this week's simulations; if we need to include auction payments, the maximum payment for each state would be associated with a case where the amount of permits auctioned would be equal to each state's cap. Also, the price per permit would be set at the equilibrium permit price.
- marginal cost curves embody direct mitigation costs only
- marginal cost curves do not include various transactions costs
- marginal cost curves do not distinguish between producer vs. consumer allocation of permits

- marginal cost curves of Arizona, New Mexico, Colorado, and Montana are developed based on mitigation costs of individual policy options presented in CCS reports of the respective State Climate Change Action Plans
- marginal cost curves of other WCI states (provinces) and all the Midwestern states are developed by a parametric shift method using New Mexico's marginal cost curve as a reference; the parametric shift rule assumes a direct relationship between the slope of the marginal cost and the carbon intensity of a state.
- emission caps for WCI states (provinces) are 15% below 2005 levels by year 2020
- though Minnesota has state GHG mitigation goals to reach 15% below the 2005 emission level by 2015, 30% by 2025, and 80% by 2050, we assume a same emission cap for Minnesota in 2020 as the WCI states in the simulations.

Case II: Upper-bound Mitigation Cost (did not include in this week's runs):

- same assumptions as for Case I, except:
- assumes half the cost-saving mitigation level for each state, i.e., the marginal cost curves are shifted upward so that the zero marginal cost level occurs at half the emission reduction level of Case I; this represents the worst-case condition, or upper-bound cost estimate, for each state to join the cap and trade mechanism

#### **Power sector only Cap and Trade Cases:**

- same assumptions as for Economy Wide runs, except:
- emission caps are for power sector only, i.e., only power sector is committed to reduce 2020 baseline emission to 15% below the 2005 level.
- power sector marginal cost curves of Arizona and New Mexico are developed based on policy options directly designed for electricity sector; marginal cost curves for other states are developed using New Mexico's curve as a reference.
- emission projections in 2020 for Midwestern states are calculated based on EIA regional projected emission growth rates. Iowa, Minnesota, North and South Dakotas belong to MAPP region (Mid Continent Area Power Pool). Illinois belongs to MAIN region (Mid-America Interconnected Network). Part of Michigan belongs to ECAR region (East Central Area Reliability Coordination Agreement) and part in MAIN. Part of Wisconsin is in MAIN and part in MAPP. Weighted average regional growth rates are applied for Michigan and Wisconsin.
- we did not include expanded Western states in this week's power sector runs

#### **2. The model yields the following general results:**

- GHG emission reductions for each state before and after permit trading
- Cost of GHG emission reductions for each state before and after trading
- Auction value of permits (some cases)
- Number of permits traded (bought and sold) by each state
- Equilibrium permit price
- Cost savings for each state of joining the Cap and Trade mechanism