Urgency, Multi-Pollutant Planning, and Environmentally Beneficial Electrification

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A key characteristic of complex systems is they don’t change linearly, they “flip” from one state to another. When they flip, the results rip through the whole economy, with impacts on a societal scale. We’re seeing this in the electricity system right now (and will soon see it in transportation).
We Have a Long History of Rapid Transformation

5th Avenue, NYC Easter Parade, 1900
See any automobiles?

Park Avenue, NYC Easter, 1913
See any horses?

How much stranded energy infrastructure cost will your state face in “13 years”?
If the “regulated monopoly” business model is largely obsolete, are its regulators too?
Air Regulators Face Similar Challenges

MAY 13, 2016

Carbon dioxide emissions from electricity generation in 2015 were lowest since 1993

Carbon dioxide emissions from the electric power sector (1990-2015)

Source: U.S. Energy Information Administration, Monthly Energy Review

Will the CPP Meet the Same Fate?

2030 Fuel Mix Forecast from CPP Proposal, June 2014

- Renewables: 16%
- Natural Gas: 33%
- Nuclear: 20%
- Coal: 31%
- Natural Gas: 34%
- Nuclear: 30%
- Coal: 30%
- Other: 2%

Today’s Fuel Mix (August 2016)

- Renewables: 15%
- Natural Gas: 34%
- Nuclear: 19%
- Coal: 30%
- Other: 2%
SEOs Role and Challenge

• Utility regulators locked into “quasi-judicial” straightjacket even as market forces take hold?

• Air regulators locked into Clean Air Act (CAA) single-pollutant delegation in a multi-pollutant, zero-threshold world?
  – And facing declining state and federal budget support?

• Who are the visionaries? Who will lead states into the multi-pollutant and electrification Promised Land?
Multi-Pollutant Synergies Produce Significant Economic and Health Benefits

Design Task: Reduce air pollution health impacts by 50%.

(Source: Based upon Bollen et al, 2009 cited in RAP 2012, Integrating Energy and Environmental Policy)
Integrated, Multi-pollutant Planning for Energy and Air Quality ("E-Merge")

Integrated Resource Planning (IRP): Forward-looking focus by energy regulators on ways to meet electric system reliability needs at least-cost, but ignores public health and environmental “externalities.”

State Implementation Plans (SIPs): Backward-looking focus by air quality regulators on achieving AQ standards, but ignores reliability, cost, and (as yet) climate issues.

Best-of-both: Forward-looking focus integrating energy reliability, cost, air quality, climate, etc.
Possible Steps of an E-Merge Process (1)

1. Determine public health (or other) goals for air quality
2. Identify ambient AQ levels needed to make goals possible
3. Identify current ambient AQ levels through monitoring
4. Identify current ambient AQ levels through monitoring

Energy solutions for a changing world
Possible Steps of an E-Merge Process (2)

4. Determine (through AQ modeling) the *target emission reductions* needed to achieve satisfactory ambient pollution levels.

5. Run optimization model against database of potential emission reduction measures until *target emission reductions and electric reliability and cost goals* are reached.
**Possible Steps of an E-Merge Process (3)**

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<tr>
<td>AQ and energy regulators collaborate to determine <strong>energy savings</strong> (and co-benefits) achievable through cost-effective energy efficiency (EE), distributed energy resources (DER), and renewable energy (RE) measures</td>
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<td>Translate (convert) EE, DER, and RE energy savings into emission reductions</td>
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**Enough to meet** target emission reductions?

- **Yes** 7
- **No** 5
Possible Steps of an E-Merge Process (4)

7

Conduct regulatory processes necessary to adopt and implement the measures identified in Steps 5-6.
Is E-Merge Legal Under the CAA?

• Columbia Law School Center for Climate Change Law (September 2013)
  - Assessed the general statutory and regulatory framework applicable to E-Merge as a voluntary program for states to adopt for air quality planning
  - Would be generally permissible under the Clean Air Act and EPA policy, given states’ wide discretion
  - Represents a viable planning approach for states to voluntarily adopt for integrated, multi-pollutant air quality planning
Bay Area AQ Management District (California, 2010)

- First comprehensive, multi-pollutant clean air plan in the US; and the first to start with explicit public health goals

- Developed “Multi-Pollutant Estimation Method” tool (MPEM) to achieve public health goals by developing a value – including co-benefits – for each ton of pollution reduced

- Includes 55 control measures; many of which simultaneously reduce air pollutants and GHGs
Maryland (2009-2013); Colorado (2010)

Maryland modeled AQ benefits from EE/RE

States needed for a full-scale multi-pollutant “pilot” process!
What the heck is EBE, and what is Emissions Efficiency?

- Energy efficiency remains the top priority…
- BUT, not every additional kWh is a bad kWh at this point. Why not?

The Grid is Getting Cleaner

Carbon Intensity of US Electric Sector Generation 2005-2030

Derived from EIA data: Monthly Energy Review, April 2016 (historic); AEO 2016 (projections).
Greater Needs, Opportunities Becoming More Clear

• Natural gas can achieve a 50% reduction but not 80%; liquid fuel (oil) emissions still high

• Electrification of vehicles, space and water heating is necessary

• EE efforts provide an “energy dividend”
  - Can be “reinvested” in electrifying vehicles and heating
  - With no increase in emissions
Hypothetical Example Results

• Population of 100,000 consumers

• If:
  - 65% upgrade space heating to electric heat pumps;
  - 74% upgrade water heaters to electric heat pumps; and
  - 14% switch to an electric vehicle

• Then:
  - Warm homes, hot showers, and VMT remain the same
  - CO2 emissions drop 25% (and other emissions drop too)
Not So Fast...

• Conflicts with CPP
  - Emission reductions outside power sector “don’t count”
  - So no help with rate-based or mass-based compliance
    - (Perhaps some, if done by generators and survives EM&V)

• Must broaden to assess:
  - *Emissions Efficiency* - more work done by same kWh and same emissions (and improving as grid gets cleaner)
  - *Not just*...
  - *Energy Efficiency* - same work done by fewer kWh
Good Steps to Start With

1. Update the “source” energy metric used by DOE/EPA in evaluating energy efficiency policies and tools

2. Recognize that the emissions intensity of the grid is declining over time when accounting for emissions associated with new electric load

3. Account for the emissions benefits of fossil fuel combustion displaced by EBE (no matter what sector)

4. Use both energy efficiency (kWh saved) and “emissions efficiency” (emissions reduced) as metrics for GHG projects
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 sector. 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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