The Benefits of End-Use Energy Efficiency:
Impacts Under EPA's Proposed Mercury and Air Toxics Standards

ACEEE Energy Efficiency as a Resource
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Topics

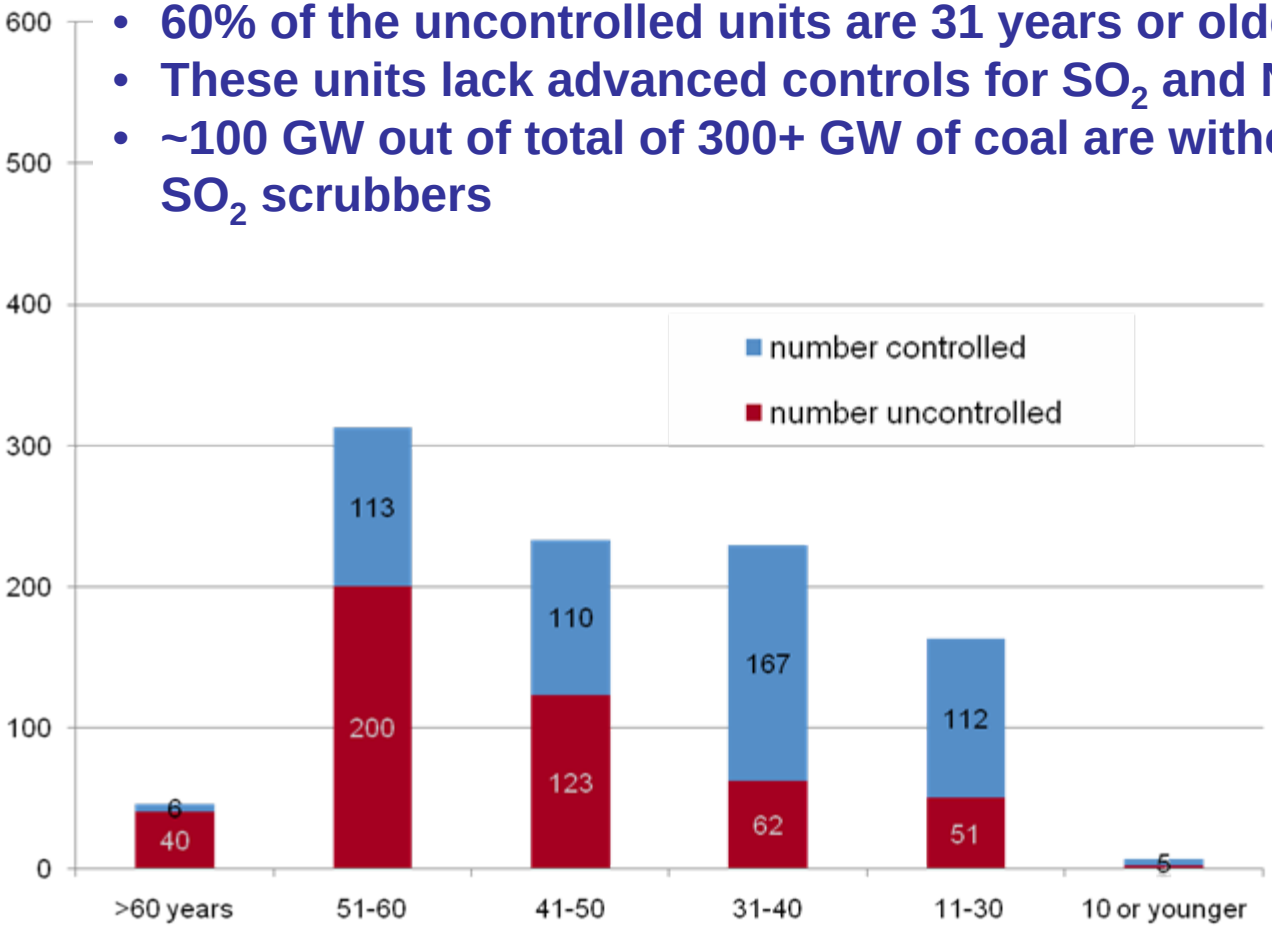
- EPA's proposed Mercury and Air Toxics Standards regulation
- Energy efficiency sensitivity
  - How was the scenario developed and analyzed?
  - What were the results of the analysis?
- Key takeaways
- For more information

Context:
Key Clean Air Power Plant Rules Overdue - Public Heath Protection Delayed

- Important Clean Air Act-required power plant controls have been delayed more than a decade.
- The Act required states by 2000 to adopt rules to control interstate pollution.
  - Clean Air Interstate Rule (CAIR) finalized in 2005 but court found legal flaws and ordered EPA to replace it. CAIR remains in place in the interim.
  - Cross-state Air Pollution Rule (CSAPR) finalized July 2011. Replaces CAIR beginning in 2012. Tightens caps further in 2014.
- The Act also required control of hazardous air pollutants from power plants.
  - Positive determination in 2000 meant final rule due by 2002.
  - Clean Air Mercury Rule for power plants finalized in 2005 but court found rule legally flawed and vacated it. Also, rule failed to address all air toxics.
  - Mercury and Air Toxics Standards rule proposed March 2011.

Many Plants Lack Controls

- 60% of the uncontrolled units are 31 years or older
- These units lack advanced controls for SO_2 and NO_X
- ~100 GW out of total of 300+ GW of coal are without SO_2 scrubbers



Total number of units

Power Plant Mercury and Air Toxics Standards (MATS) Rule

- On March 16, 2011, EPA proposed the Mercury and Air Toxics Standards, *the first national standards,* to reduce emissions of toxic air pollutants from **new and existing coal- and oil-fired power plants** – often the biggest contributors to air pollution
- Standards would reduce emissions of:
  - Metals, including mercury (Hg), arsenic, chromium, and nickel
  - Acid gases, including hydrogen chloride (HCl) and hydrogen fluoride (HF)
  - Particulate matter
- Pollutants are linked to cancer, IQ loss, heart disease, lung disease and premature death
- Standards create uniform emissions-control requirements based on proven, currently in-use technologies and processes
  - For each pollutant, there is an existing and a new source standard
  - Choice in format – input or output-based standard
  - Averaging allowed – across units and over time
- Compliance set by Clean Air Act: up to 4 years (3 + 1 additional, if granted)

Power Plant MATS Rule Proposal
Illustrative Energy Efficiency Sensitivity (1/2)

- Developed scenario to illustrate impacts of integrating EE within compliance strategy
  - "EE sensitivity" based upon two key drivers of future EE investments
    - Ratepayer-funded EE programs (state policy driven)
    - Federal appliance standards (DOE rulemakings required by current statutes)
  - Represents significant reductions in US electricity demand (5.3% in 2020 and 6.6% in 2030)
  - Modeled power sector impacts using IPM and combined with estimates of EE costs
- Positive results
  - Economic benefits
    - Reduces costs of Toxics Rule, and reduces electricity and natural gas prices
  - Reliability benefits
    - Reduces required new generation and reduces required new emissions controls
  - Reduces air emissions of NOx, SO2, Hg, and CO2
- Key takeaways
  - Leveraging end-use EE investments will reduce costs and help achieve timely compliance
  - EPA is working closely with other Federal (DOE, FERC) and State (PUC, SEO) agencies with relevant EE authorities and expertise
  - We encourage state agencies, power companies, regional grid operators and other key participants to engage in early planning to ensure orderly and affordable compliance

Power Plant MATS Rule Proposal

Illustrative Energy Efficiency Sensitivity (2/2)

- Purpose of EE Sensitivity
  - To demonstrate potential impacts of increasing/maintaining federal and state energy efficiency policies within the context of MATS rule
- Developed illustrative end-use EE policy scenario ("EE Sensitivity") to evaluate impacts based on two key drivers of increasing EE investment:
  1. Increasing investment in **ratepayer-funded EE programs**
     Driven by state policies such as EERS and IRP/DSM plans
     EPA analysis based on comprehensive 2009 LBNL study (1)
  2. DOE's rulemakings for **federal appliance standards**
     Driven by existing federal statutory mandates (EISA 2007, EPACT 2005 and EPACT 1992)
     EPA analysis based on DOE estimates of 30+ required rulemakings (2)
- For both drivers, EPA has made assumptions required to project demand impacts and associated costs as well as to implement within IPM
- Estimated demand reductions by year and associated costs
  - EE program cost assumption: $46/MWh ($25 Prog. Admin. + $21 Participant)
  - Appliance Standards cost assumption: $34/MWh
- EE Sensitivity and associated results discussed in rule preamble and RIA

(1) The Shifting Landscape of Ratepayer Funded Energy Efficiency in the U.S., Galen Barbose et. al., October 2009, Lawrence Berkeley National Laboratory, LBNL-2258E

(2) Provided by DOE/EERE/EE

Energy Efficiency Sensitivity

Results: Electricity Demand Reductions

(all in TWh)	2012	2015	2020	2030	2040	2050
Ratepayer-funded EE Programs	59	110	174	198	198	198
% of U.S. Demand	1.5%	2.7%	4.1%	4.2%	3.9%	3.6%
Federal Appliance Standards	0	6	52	112	114	124
% of U.S. Demand	0.0%	0.2%	1.2%	2.4%	2.2%	2.2%
Total EE Demand Reductions	59	117	226	310	312	322
% of U.S. Demand	**1.5%**	**2.9%**	**5.3%**	**6.6%**	**6.1%**	**5.8%**
U.S. Electricity Demand (EPA Reference)	4,043	4,086	4,302	4,703	5,113	5,568
Average Annual Growth Rate (2009 to 20xx)		**1.05%**	**1.04%**	**0.97%**	**0.93%**	**0.91%**
Net Demand after EE	3,984	3,969	4,076	4,392	4,801	5,246
Average Annual Growth Rate (2009 to 20xx)		**0.56%**	**0.55%**	**0.64%**	**0.73%**	**0.77%**

EE Sensitivity
Interpreting IPM Results

- Four cases in IPM
  - Base
  - Base + EE
  - Policy (MATS rule)
  - Policy + EE
- Incremental impacts
  1. (Base) compared to (Base + EE)
     - Impact of EE policies on reference case (absent MATS rule)
  2. (Policy) compared to (Policy + EE):
     - Impact of EE policies on MATS rule case
  3. (Base) compared to (Policy):
     - Impact of MATS rule
  4. (Base + EE) compared to (Policy + EE):
     - Impact of MATS rule in case with greater EE investments
  5. (Base to Policy) compared to (Base + EE to Policy + EE):
     - Impact of MATS rule with and without greater EE investments
  6. (Base) compared to (Policy + EE):
     - Combined Impact of MATS rule and greater EE investments

IPM Results

Electric System Generation & EE Costs

- Base & Toxics Rule Cases reflect annual electric system generation costs
- Base+EE & Toxics Rule+EE Cases reflect annual electric system generation costs + EE costs
  - EE costs include program administrator, program participant & consumer costs
- EE reduces total costs relative to both Base and Toxics Rule cases
  - In 2020, reduces Base costs by $5B and Toxics Rule costs by $6B
- EE reduces incremental cost of the Toxics Rule
  - In 2015, 2020 and 2030, costs are reduced by $0.3B, $1B and $1B, respectively

TOTAL COSTS (billion 2007$) -- IPM + Total EE	2015	2020	2030
Base	144	155	200
Base+EE	142	150	190
Toxics Rule	155	165	210
Toxics Rule+EE	153	159	199
1. Increment (Base to Base+EE)	-2	-5	-11
2. Increment (Toxics Rule to Toxics Rule+EE)	-2	-6	-11
3. Increment (Base to Toxics Rule)	11	10	10
4. Increment (Base+EE to Toxics Rule+EE)	11	9	9
5. Increment (Base to Toxics Rule) to (Base+EE to Toxics Rule+EE)	0	-1	-1
6. Increment (Base to Toxics Rule+EE)	9	4	-1

IPM Results

Total Retirements

- EE doubles total retirements relative to Base in 2020
  - From 27.4 GW to 54.2 GW
- EE increases total retirements relative to Toxics Rule Case in 2020
  - From 35.1 GW to 60.1 GW
- Important to recognize that the additional "retirements" in the EE cases occur because the capacity is not needed

RETIREMENTS Grand Total & (Coal) (GW)	2015	2020	2030
Base	27 (5)	27 (5)	27 (5)
Base+EE	38 (12)	54 (12)	53 (12)
Toxics Rule	35 (15)	35 (14)	35 (14)
Toxics Rule+EE	47 (25)	60 (24)	60 (24)
1. Increment (Base to Base+EE)	11 (7)	27 (7)	26 (7)
2. Increment (Toxics Rule to Toxics Rule+EE)	11 (10)	25 (10)	24 (10)
3. Increment (Base to Toxics Rule)	9 (10)	8 (9)	8 (9)
4. Increment (Base+EE to Toxics Rule+EE)	9 (13)	6 (12)	6 (12)
5. Increment (Base to Toxics Rule) to (Base+EE to Toxics Rule+EE)	0 (3.0)	-2 (3)	-2 (3)
6. Increment (Base to Toxics Rule+EE)	20 (20)	33 (19)	32 (19)

IPM Results

New Generation Capacity

- EE significantly reduces new capacity builds through 2020 and beyond under Toxics Rule
  - Through 2020: 8.5 fewer GWs of new capacity required (30.8 versus 39.2 GW)
  - Through 2030: 39.8 fewer GWs required (76.3 versus 116 GW)
  - However, fairly small impact through 2015: 0.3 GW fewer GWs required

NEW CAPACITY Grand Total (Cumulative GW)	2015	2020	2030
Base	29.6	36.3	108.0
Base+EE	29.3	30.6	71.2
Toxics Rule	29.7	39.2	116.0
Toxics Rule+EE	29.4	30.8	76.3
1. Increment (Base to Base+EE)	-0.4	-5.7	-36.9
2. Increment (Toxics Rule to Toxics Rule+EE)	-0.3	-8.5	-39.8
3. Increment (Base to Toxics Rule)	0.1	3.0	8.0
4. Increment (Base+EE to Toxics Rule+EE)	0.1	0.2	5.1
5. Increment (Base to Toxics Rule) to (Base+EE to Toxics Rule+EE)	0.1	-2.8	-2.9
6. Increment (Base to Toxics Rule+EE)	-0.2	-5.5	-31.8

IPM Results

National CO2 Emissions

- EE significantly reduces carbon dioxide emissions
  - By > 100 MMTCO2 per year in 2020 and 2030

NATIONWIDE EMISSIONS (CO2, million metric tons)	2015	2020	2030
Base	2243	2326	2484
Base+EE	2190	2222	2372
Toxics Rule	2219	2297	2449
Toxics Rule+EE	2144	2181	2321
1. Increment (Base to Base+EE)	-53	-103	-112
2. Increment (Toxics Rule to Toxics Rule+EE)	-74	-115	-128
3. Increment (Base to Toxics Rule)	-24	-29	-35
4. Increment (Base+EE to Toxics Rule+EE)	-45	-41	-51
5. Increment (Base to Toxics Rule) to (Base+EE to Toxics Rule+EE)	-21	-12	-16
6. Increment (Base to Toxics Rule+EE)	-99	-144	-163

Other IPM Results

- National Retail Electricity Prices
- Natural Gas Prices (Henry Hub)
- New Emissions Controls
- Other Emissions (SO2, NOx, Hg)

Benefits of Energy Efficiency: Impacts Under EPA's Proposed MATS (and Other Power Sector Regulations)

Key Takeaways

- Leveraging end-use EE investments will reduce costs and help achieve timely compliance with environmental regulations
  - EE will reduce electricity and natural gas prices, and consumers bills
- EE will reduce all air emissions from power plants
  - Emissions targeted by particular regulation (e.g., toxics) as well as other pollutants (e.g., NOx, SO2, and CO2)
- EE will benefit grid reliability by reducing need for new generation and new emissions controls
  - However, EE will also drive additional retirements of older, less efficient fossil units
- State agencies, power companies, regional grid operators and other key participants need to engage in early planning to ensure orderly and affordable compliance
  - This is an important opportunity to demonstrate the contribution that EE can make

EPA United States Environmental Protection Agency

EPA's Mercury & Air Toxics Standards
Energy Efficiency (EE) Sensitivity
For more information

- Proposed Rule, Regulatory Impact Analysis, and IPM Results are publicly available: http://www.epa.gov/airquality/powerplanttoxics/actions.html
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