REALIZING THE IMMENSE POTENTIAL OF SEM TO MEET CLIMATE (AND JOB CREATION) GOALS

Presented to NEEP
New York City
8 November 2017

DAVID B. GOLDSTEIN, PH.D.
NATURAL RESOURCES DEFENSE COUNCIL
DGOLDSTEIN@NRDC.ORG

What is SEM?

- Strategic Energy Management (SEM) is a relatively new concept in industrial energy efficiency policy in most countries.
  - It was developed over a decade, culminating in ISO 50001 in 2011.
  - 50001 has not been used much by administered EE programs, but could lead to larger savings
  - CEE has developed a definition of SEM for administered programs that is more inclusive than 50001-based programs

    https://library.cee1.org/content/cee-strategic-energy-management-minimum-elements/

- SEM programs can encourage a broad, diverse set of efficiency measures, including operations and capital upgrades.
- Analysis of pilot SEM programs indicate participants can *achieve much greater energy savings* and *sustain these high rates of annual savings* than most energy efficiency potential studies would indicate possible.

Climate Change: Melting Glaciers

Climate Change: Forest Fires

SEM can help meet the commitments of the Paris Agreement

- The U.S. is still bound by this agreement at least till November 2020.
  - The next President could rejoin the agreement.
  - States/provinces such as California and the Northwest are accelerating their efforts to cut emissions.
  - Canada is part of the agreement.
- The Agreement calls for limiting climate change to 2 degrees C and for pursuing efforts to limit it to 1.5 degrees.
- The industrial sector is a more difficult sector in which to achieve substantial emissions reductions in-line with a 2-degree or 1.5-degree trajectory.
- A broader deployment of SEM – and the associated energy savings from these programs – could offer greater lower-cost opportunities to reduce industrial energy use and emissions that have not been included in deep decarbonization modeling of the U.S. economy historically.

This talk discusses a two-step analytic process

- First, model in detail what it takes to limit climate change to 2 degrees

  https://www.nrdc.org/sites/default/files/americas-clean-energy-frontier-report.pdf

- Next, using the model results, estimate what else is needed to meet the stricter 1.5 degree limit
- The results show a greatly expanded role for SEM

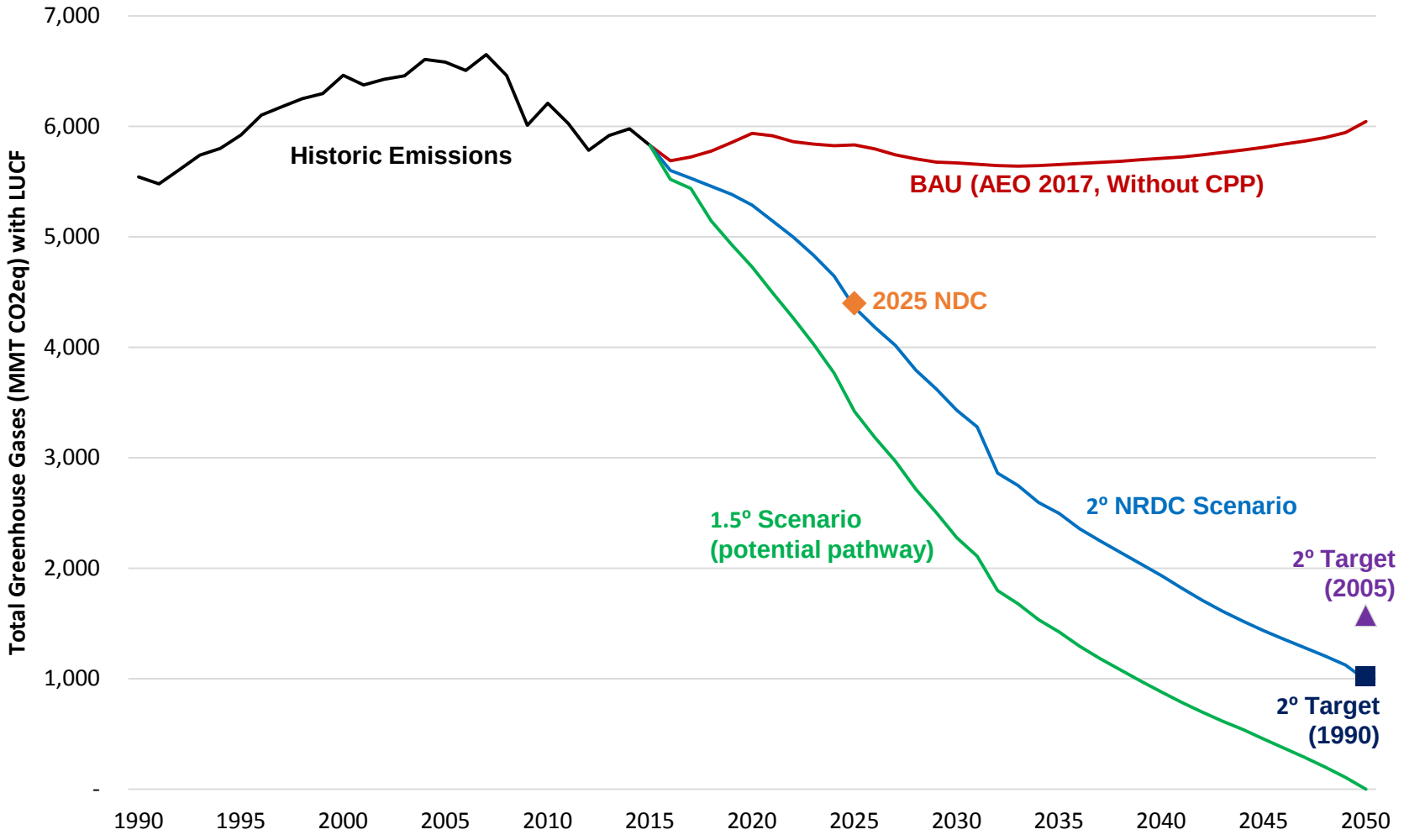
SEM is one of 6 key additional policies to meet the 1.5 degree goal

- The others are:
  - Fast, deep retrofit of buildings
  - Smart growth and shared mobility
  - Saving energy in the supply chain*
  - Improved forestry practices
  - Reducing methane leaks
- See *https://electricitypolicy.com/images/2017/.../Goldstein/Goldstein01Feb2017.pdf; or*

  https://www.nrdc.org/experts/david-b-goldstein/getting-tough-climate-pollution-limiting-warming-15
- All of these policies promote job creation at scale, and enhance equitable economic development.

*supply chain savings could be part of SEM

U.S. Pathways to Paris' Long-term Goals



What is the role of SEM in the 1.5-degree scenario?

How can SEM contribute to further reductions?

- Most 2-degree modeling only considers traditional, single-process efficiency improvements for industry.
  - A majority of energy savings come from efficiency improvements in motors, heat pump, and boilers, as well as a build-out of CHP.
- 2-degree scenarios underestimate the potential efficiency reductions available in the industrial sector through the deployment of more cross-cutting, holistic efficiency improvements.
  - These additional energy savings in the industrial sector can be achieved through a broad deployment of SEM programs in the U.S. – and could further reduce the carbon footprint of industry below what is required for a 2-degree scenario.

What is the role of SEM in the 1.5-degree scenario? III

What can SEM achieve?

- Superior Energy Performance (DOE SEM program) achieved average savings of 14% compared to baseline in just one year and average savings of 30% over three years.
- A reasonable 10-year target for SEM program participants was cited as 25-40% energy savings.
  - For comparison, U.S. decarbonization studies tend to achieve total industrial savings of only 5-10% over the first 15 years (by 2030).

What is the role of SEM in the 1.5-degree scenario? IV

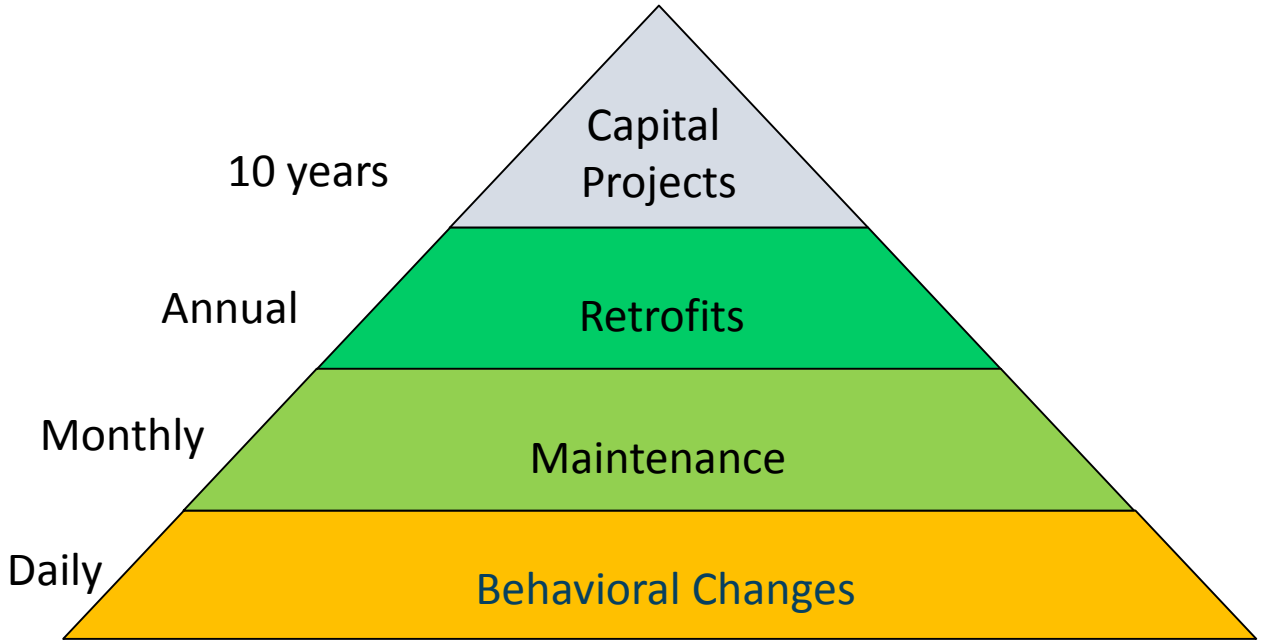
What could be the energy and emissions impact?

- Achieving a 40% energy reduction across the industrial sector in 15 years could save an additional 7 quads of industrial energy in 2030 over a 2-degree scenario.
- Using the average emissions intensity of industry in these decarbonization scenarios, this saved energy is **equivalent to additional industrial emissions savings of 400 MMT** in 2030 over a 2-degree scenario.

Other strategic values of SEM

- SEM facilitates ***realizing savings*** whether or not they are contained in potentials studies by considering multiple time scales of implementation. SEM requires management systematically analyze, implement, and measure energy (and thus emissions) savings opportunities on a regular basis over a multi-year period.
- SEM requires ***continual improvement,*** a factor that is seldom included in potentials studies or traditional industrial efficiency programs.
  - More narrow programs and efficiency measures tend to result in a significant decline in energy savings after the first year. Low-cost, energy-saving O&M improvements often vanish when organizational attention on energy usage declines.
- SEM requires ***top management commitment*** to improving energy performance, including assuring that adequate resources are available to implement identified improvements.
  - Management has to commit these resources for the necessary (multi-year) time required to ensure that these savings persist.

Time Frame for Efficiency Actions



SEM allows integrated planning based on these time frames

- Small capital projects (retrofits) can be planned to coincide with regular plant shutdowns for upgrades or maintenance, reducing costs
- Major capital upgrades for energy can be integrated with major modernization efforts, reducing costs and downtime
- These physical upgrades can be done in compliance with a plan that also includes management improvements such as better maintenance and scheduling as well as behavioral changes that are refreshed on a daily or weekly basis

Non-energy benefits of SEM

- Job creation and retention
  - SEM creates direct jobs of energy management and upgrading in the facilities that use it, and in audit and design consultants they use, and in the manufacture of new equipment and components
  - Plants with SEM are more productive and likely to expand production rather than move away
- Plants that strategically manage energy will likely apply the same methods to other KPIs and will be more competitive, creating or retaining jobs

Conclusions from the Analysis

- SEM is usually overlooked in 2 degree scenarios
  - …which rely almost entirely on widget-based efficiency improvements
- There is not yet a very robust empirical basis for estimating savings from a broad deployment of SEM, but ***observed results from pilot programs have beaten expectations***.
  - greater potential savings than most existing efficiency potential studies and decarbonization modeling assume.
- SEM could be a new tool to reduce U.S. energy consumption and associate greenhouse gas emissions beyond what is required for a 2-degree trajectory.

- BUT…
  - This would take a VASTLY EXPANDED EFFORT on SEM
    - Increasing both the breadth (number of participating organizations) and depth (greater annual improvements in energy performance) of the savings

Results of SEM to date in North America: National Programs

- Programs based on a structured Energy Management Systems Standard such as ISO 50001 generally have been both voluntary and unincentivized
  - Despite this, savings have been about 11% (compared to business as usual) after about a year
  - Most of the savings have been from non-capital improvements
  - These savings are comparable to those of incentivized but informal utility program results
    - Many or most of these count only non-capital-investment measures
- Retention of the SEM commitment has been an issue
  - Mean lifetime of SEM without continuing incentives was 4 1/2 years

Barriers to SEM

- SEM commitments to regulation are like regulation: your boss sets requirements that you have to meet.
  - Not many organizations like to be regulated
- In the absence of regulation, incentives are likely needed.
- We need to encourage
  - Greater ***breadth*** of acceptance of SEM
  - Greater ***depth*** of savings
- The program suggested next can complement existing administered programs and also seek new participants

Seeking greater breadth

- Germany decided to exempt ISO-50001-compliant facilities from its renewable energy surcharge of about €0.04 per kWh, and
  - Germany accounts for about half of all global certifications
- Thus, financial incentives for participation seem to work well
- We propose the incentive be richer for higher levels of third-party review:
  - 1 x for DOE 50001 Ready
  - 2 x for ISO 50001 certification from a qualified auditor
  - 3 x for Superior Energy Performance (SEP) certification

Seeking ongoing commitment

- Without external reinforcement, the mean time for a facility to continue in an SEM project is only 4.5 years
- Thus we suggest:
  - 1/3 of the previous incentive for 3 years of maintaining ISO 50001 certification
  - 2/3 for maintaining SEP certification

Addressing Barriers to Industrial Investment in Efficiency

- It is broadly demonstrated that industrial facilities in the U.S. seldom invest in projects with paybacks of 3 years or greater.
  - It follows that money up front is likely to be a big motivator
  - This hypothesis can be tested by implementing the following incentive for larger energy savings from SEM
  - Payments are based on the amount of energy saved over a user-selected timeframe
  - This experiment fails safely (if it fails): if the motivation is not there, the cost of the program is minimal.
- The program is based on successful American tax incentives for buildings and equipment: PAY FOR PERFORMANCE

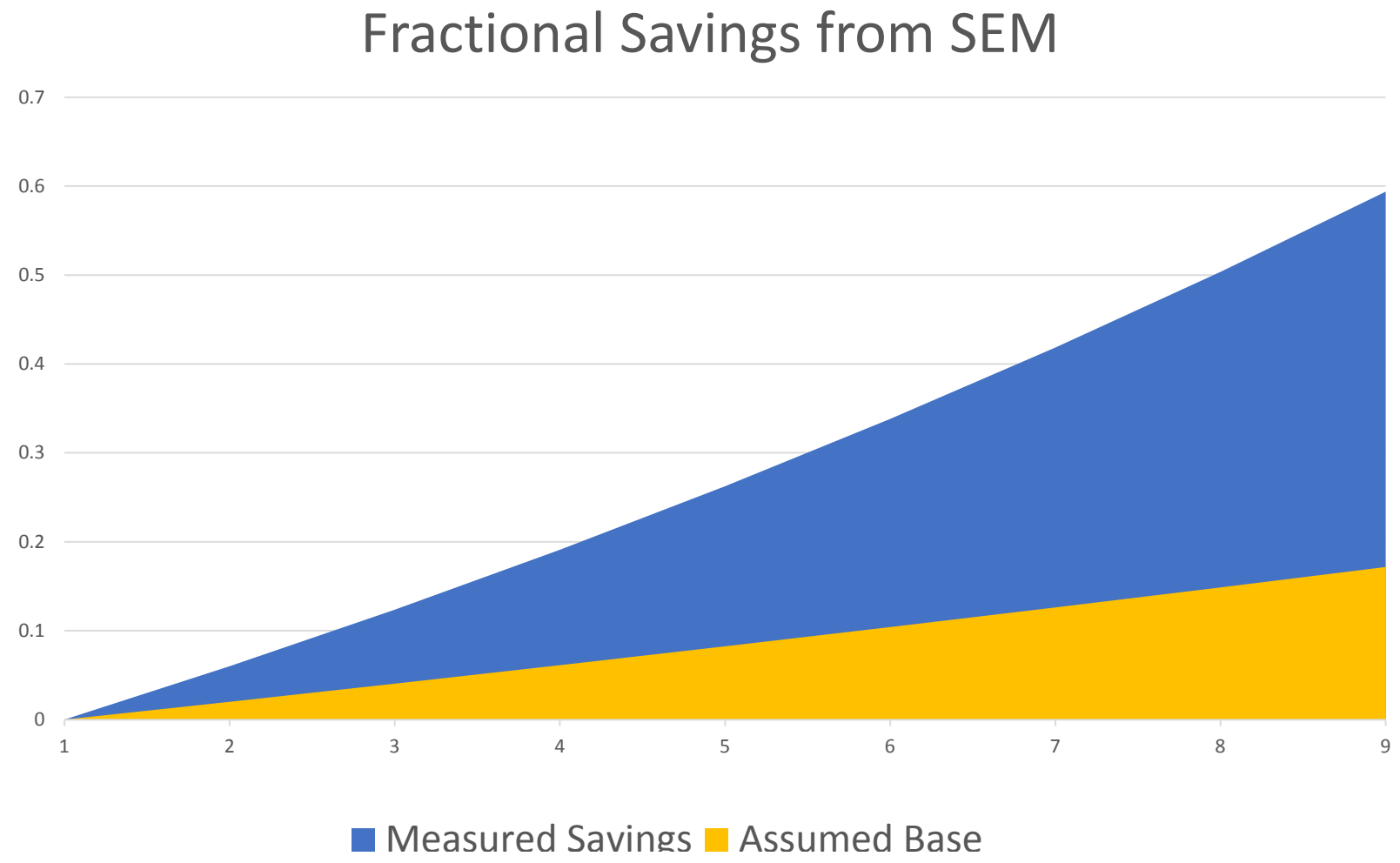
Structure of the Program

- Taxpayer selects a timeframe: 3, 6, or 9 years
- Program provide a tax deduction of a fixed amount per cumulative kWh or Mbtu saved over the chosen period
  - This incentive provides all the benefits up front
  - Tax deductions make program pay for itself: only tax paying companies qualify. Tax paying organizations deduct energy costs to reduce corporate income taxes, so the savings from the program mean more taxable profit
- Program claws back incentives if tax-payer proposed targets are not met
  - But realistically if a facility is behind their target they can invest more in efficiency to true up over the next year(s)

Paying only for “additional” savings

- Payments are based on metered energy performance indicators as certified in an ISO-50001/SEP compliant energy management systems standard
- The program assumes that savings would have occurred even without the program at a rate 1% per year higher than the historic performance of the NAICS sector in which the facility belongs
  - DOE will determine which sector and what the base rates are.
  - This evaluation protocol avoids asking unanswerable widget-level questions such as “ would the plant have replaced this boiler in year n anyway?” and “what efficiency level would they have chosen?”.
  - Instead it turns such questions in to answerable statistical questions: what are observed industrywide rates of energy performance improvement?

Paying for Cumulative Savings



Why use the tax system?

- It provides uniform program structure across regions
- It could be coordinated internationally as well.
- The tax code is best for innovative programs with ambitious goals because it can offer assurance of multi-year continuity
  - ..and because tax programs do not have budgetary limits.
- Claw-backs are harder to administer on a regional basis due to the conflict between energy goals and plant retention goals.

Seeking Feedback from YOU

- Previous tax incentives involved extensive discussion with a wide variety of stakeholders in business, in utilities, in government, in NGOs…
- This discussion improved the quality of the proposal, fleshing out details that had been glossed over.
- The revisions (dozens in the case of commercial whole buildings [IRS Code Section179(d)]) improved the political prospects of the proposal as well as enhancing the policy.

Conclusions

There is a large if impossible-to-quantify potential for increasing energy efficiency in industry through SEM

SEM also offers the opportunity to develop more manufacturing jobs through making industry more competitive globally as well as through making the materials and supplies needed to improve energy performance

Uptake of SEM has been too slow to meet climate goals or economic development/job creation goals

Incentives could increase both the uptake and the depth of savings from SEM

This type of incentive has been tried before and has succeeded, sometimes dramatically.

Thank you

Please contact me at

DGoldstein@NRDC.org

for questions or comments