Connecticut Department of Energy and Environmental Protection

Connecticut Department of
ENERGY &
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PROTECTION

AN INTRODUCTION TO AIR POLLUTION CONTROL COSTS

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Daniel Vesa, PE
Stationary Sources Control Group

Connecticut Department of Energy and Environmental Protection

Air Pollution Control Costs Summary

- This presentation outlines a **DEEP methodology** to estimate the cost effectiveness of the air pollution controls applicable to the emission units subject to a RACT case-by-case demonstration.

Air Pollution Control Costs Summary

- The methodology will enable one to conduct a cost assessment to demonstrate the economic feasibility (or infeasibility) of an air pollution control, technologically & commercially available, that may (or may not) ensure compliance with the proposed NOx limits.

- The forms required by the newly proposed Section 22e, for a case-by-case RACT demonstration will be developed based on this proposed DEEP methodology to estimate cost effectiveness of the controls.

Air Pollution Control Costs Summary

- At the beginning, the presentation includes a summary of the requirements for the emission controls applicable to the emission units subject to the newly proposed Section 22e
- In general, the emission controls identified as applicable for the emission units subject to a RACT case-by-case demonstration, ought to be:
  - Technologically feasible & commercially available
  - Economically feasible

Air Pollution Control Costs Summary

- Control's "economic feasibility" is demonstrated if the control's "cost effectiveness" calculated value, in $/ton, is equal to or smaller than a suggested $/ton value accepted by the commissioner.
- The control's cost effectiveness is defined as the cost in dollars per ton of NOx removed per year.
- The control's cost effectiveness is calculated following a methodology suggested by DEEP and approved by the commissioner.

Air Pollution Control Costs Summary

- The proposed DEEP methodology , including:
  - controls' cost effectiveness calculation formulas,
  - assessment of the various cost elements, and
  - estimated "tons of NOx removed"

  will follow the EPA's guidelines, and recommended methods to estimate various costs, that are detailed in published documents.

Air Pollution Control Costs Summary

- The suggested cost elements of an air pollution control are listed in detail on two slides.
- The last slides include:
  - List of the principal EPA cost documentation available
  - A proposed approach to process the diverse EPA data, and
  - Conclusion

Section 22e Requirements

- According to RCSA Section 22a-174-22e, Subsection (h)(1)(A)(i) an owner or operator of an emission unit, before requesting an emission limitation, should demonstrate that:

  "The use of available emissions control technology is either technologically or economically infeasible for the emission unit that is the subject of the (RACT) demonstration"

In other words the emission control technology must be:

- Commercially available, not a pilot/research project &
- Economically feasible.

Section 22e Requirements

- RCSA Section 22a-174-22e, Subsection (h)(5)(C) requires an owner or operator of an emission unit to:

"Evaluate the control effectiveness of feasible alternatives in terms of NOx emissions reduced."

In other words:

- identify all technologically & commercially available NOx emission control alternatives and
- perform a cost assessment to demonstrate the economic feasibility (or infeasibility) of an air pollution control that may (or may not) ensure compliance with the proposed NOx limits.

Section 22e Requirements

- Per RCSA Section 22a-174-22e, Subsection (h)(5)(E):

  "Evaluate the control effectiveness of each feasible control alternative on an annualized basis as the cost in US dollars per ton of NOx reduced ($/ton)."

- Per RCSA Section 22a-174-22e, Subsection (h)(1)(A)(iii) a control alternative is "**presumed economically feasible**", if any **$/ton** determined value is:

  ≤ $13,118/ton NOx – for Phase 1 determination, or
  ≤ $13,635/ton NOx – for Phase 2 determination.

Section 22e Requirements

- RCSA Section 22a-174-22e, Subsection (h)(5) states:

"A case-by-case RACT demonstration submitted pursuant to this subsection shall be made on forms provided by the commissioner and performed according to procedures identified by the commissioner."

Consequently:

- DEEP will provide **forms** using the methodology to estimate cost effectiveness index, in $/ton, in terms of NOx emissions reduced for commercially available air pollution controls.

Cost Effectiveness [$/ton NOx (R)]

Cost Effectiveness is defined as:

$$\$/\text{ton NOx (reduced)/period} = \frac{\text{TOTAL ANNUAL COST, [\$/yr]}}{\text{NOx (reduced), [tons/period]}}$$

where:

Period = time frame considered, defined in RCSA Section 22a-174-22e, Subsection (h)(5) (D) as, either:

- 8760 hours/year – full load basis*, or
- hours of operation of the emission unit subject to a practicably enforceable limitation defined by:
  - permit or
  - consent order

**Note: 8760 hours/year is the "period" selected default value included in the DEEP methodology*

Cost Effectiveness [$/ton NOx (R)]

Total Annual Costs and other subsequent terms required to assess controls' Cost Effectiveness are defined as:

$$\text{TOTAL ANNUAL COST, [\$/yr]} = \text{ANNUALIZED CAPITAL COST, [\$/yr]} + \text{ANNUAL OPERATING COST, [\$/yr]}$$

$$\text{ANNUALIZED CAPITAL COST, [\$/yr]} = \text{TOTAL CAPITAL INVESTMENT, [\$]} \times \text{CAPITAL RECOVERY FACTOR}$$

$$\text{CAPITAL RECOVERY FACTOR} = \left(\frac{i\,(1+i)^n}{(1+i)^n - 1} \right)$$

where:

- i = interest rate
- n = air pollution control book life value

Cost Effectiveness [$/ton NOx (R)]

Notes:

TOTAL CAPITAL INVESTMENT and **ANNUAL OPERATING COST**, may be estimated based on available data either by using:

- Control specific cost, in $/MW and the unit nominal MW capacity,
- EPA's formulas proposed in the 2015 updates of the Cost Manual and in IPM v5.13 (items 1, 2 & 3 in the "List of references" slide below), or
- EPA's methodology detailed in the 2002 Cost Manual and in ACT documents (items 4, 5, 6 & 7 in the "List of references" slide below)

Cost Effectiveness [$/ton NOx (R)]

TOTAL CAPITAL INVESTMENT and **ANNUAL OPERATING COSTS**

Assessment Using Controls' Specific Costs

$$\textbf{TOTAL CAPITAL INVESTMENT}, [\$] = \\ = \textbf{CONTROL TCI}_{\textbf{specific}}\ \textbf{COST}, [\$/\textbf{MW}] \times \textbf{SOURCE NOM CAPACITY}, [\textbf{MW}]$$

$$\textbf{ANNUAL OPERATING COST}, [\$/\textbf{yr}] = \\ = \textbf{CONTROL OP}_{\textbf{specific}}\ \textbf{COST}, [\$/\textbf{MW}] \times \textbf{SOURCE NOM CAPACITY}, [\textbf{MW}]$$

Note:

CAUTION should be exercised when using Controls' specific costs:

- Verify if data is applicable to the type of control and size (nominal capacity),
- Past years "specific costs" may be used, corrected to the current year by using Consumer Price Index (CPI) published by the U.S Bureau of Labor Statistics:

  http://www.bls.gov/data/inflation_calculator.htm
- Always provide the "cost specific" source reference data, for verification.

Costs Elements

The next two slides display the cost elements of the control's **TOTAL CAPITAL INVESTMENT** and **TOTAL ANNUAL COSTS** in a graphical representation based on the EPA's approach.

- Specific factors/multipliers for various items shown in the tables attached, first proposed in ACT documents and in the 2002 Cost Manual remain unchanged in the latest cost manual revisions and in IPM; only specific costs of water, electricity, reagent, and other similar items have been updated.
- If data is not available, an older year specific cost $$ amount may be used; however the result should be corrected for a current year using Consumer Price Index (CPI) published by the U.S. Bureau of Labor Statistics: http://www.bls.gov/data/inflation_calculator.htm

TOTAL CAPITAL INVESTMENT - COST ELEMENTS DEFINITION

[1] [2]

TOTAL CAPITAL INVESTMNET

TOTAL DIRECT COST

PROCUREMENT

Purchased Equipment / Procurement Cost		[3]
1. Primary Control Device		
2. Auxiliary Equipment		
– Primary Control Accessories / Parts		
Primary Control Device Enclosure		
Catalyst Box Steel (SCR only)		
Induced Draft Fans		
Ductwork		
– Reagent Storage System		
Tanks		
Heaters and Accessories		
– Water Supply and Treatment System		
Demineralizer		
Linear Valves and Filters (HPWI)		
Misc. Pumps		
– Expansion Joints		
– Injectors and Injectors Retract		
Retract Panel		
Distributor Module		
– Fuel Manifold & Controller		
– Stack Equipment		
3. Operation and Control		
– System Program Control (PLC, DSC)		
Control Operation Panel/Display		
Peripheral Transducers		
Control Accessories		
– Instrumentation		
– Metering Skid		
4. Electrical Equipment		
– Power Supply		
Power Control Modules (PCM)		
Electrical Panels		
– Major Electrical Equipment		
5. Other Required Equipment		[4]
– Recommended by Manufacturer		
– Recommended by EPA (see Annex 2)		
– Other Operation and Control Accessories		
Equipment Cost (Total of the above) - EC		
– Sales Tax	8% EC	[5]
– Freight		
Equipment Procurement Cost = A1		

DIRECT INSTALLATION

Direct Installation Costs		[8]
1. Construction Contracts		
– Structural Requirements and Materials		
Foundations, Structures and Supports		
Structural Steel Materials		
Platforms / Misc. Metals		
Stack Foundations		
Fan Base Steel		
Duct Supports		
Structural Steel Modifications		
– Installation Labor and Materials		
Control System Field Assembly		
Equipment Insulation & Lagging		
Piping, Valves and Fittings		
Insulation and Cladding		
Electrical Accessories		
Painting		
Water System Interconnect		
– Demolition and Clean up		
– Construction Power		
2. Modification and Alteration Costs		
– Existing Equipment		
Equipment Modifications		
Existing Equipment Relocation		
– Piping and Electrical		
Modification		
Relocation		
– Easement and Building Modification		
3. Furnish and Erect Contracts		
– Handling and Erection		
– Fire Protection System		
– Stack Priming / Repair		
– Acoustical and Vibration Treatment		
– Existing Equipment Repair		
Direct Installation Cost (Total of the above) DC		
– Sales Tax (usually included in costs above)	0.00%	[9]
– Freight (usually included in costs above)		
Total Direct Installation Cost = A2	**45%(A1)**	[10]

BUILDING

Buildings Cost (A3)			[6]
– Building Construction	A3	$0	
– Building Alteration			

SITE PREPARATION

Site Preparation Cost			[7]
only required at grass roots installation	A4	$0	

TOTAL DIRECT COST = A1 + A2 + A3 + A4 = A

TOTAL INDIRECT COST

INDIRECT INSTALLATION

Indirect Installation Costs		[11]
1. General Facilities Costs	5% (A)	
– Construction Expenses		
Field Expenses		
Contractor Fees		
Construction Incentives		
Construction Services		
– Project Management		
Commissioning		
Supervisory Personnel		
2. Engineering and Home Office	10% (A)	
– Engineering and Testing Contracts		
Site Survey		
Engineering Contracts		
Coordination Engineering		
Modeling		
Start-up		
Stack Inspect / Testing		
Initial Testing Fuel		
Performance Testing		
Emission Compliance Testing		
Civil/Structural Testing		
Noise Testing		
– Home Office		
Office Personnel		
Office Fees		
Temporary Offices		
3. Process Contingency	5% (A)	
Indirect Installation Cost (Total of the above) - IC		
– Sales Tax (usually included in costs above)	0.00%	
– Freight (usually included in costs above)		
Total Indirect Installation Cost	**20% (A)**	[12]

CONTINGENCY

Sale Tax & Contingency Factors		[13]
1. Direct / Indirect Cost Sale Tax Estimate (if not else included)		
2. Project Contingency Factors		
– Project Contingency		
– Economic Conditions		
– Site Factor		
– Other Factors (escalation)		
3. Construction Contingency		
Total Contingency = C	**15% (A+B)**	[14]

OWNING COST

Other Indirect Costs / Miscellaneous			[15]
– Allowance for Funds during Construction	E	$0	
– Regulatory Fees and Permits	F	$0	
– Licenses Fees			
– Royalty Allowance			
– Legal Fees			
– Builders Risk Insurance			
– Preproduction Costs	G	2% (D+E)	
Site Specific Costs			
Other Testing Contracts			
• Civil/Structural Testing			
• Noise Testing			
Special Modeling (CFD)			
– Inventory Capital (cost for reagent stored at site, i.e. the first fill of the reagent tanks)	H	$0	
– Initial Accessories Cost	I	$0	
• Catalyst Cost (for SCR)			
– Initial Chemicals Cost			
Total Owning Cost = E + F + G + H + I		**2% (D+E)**	

Note: **D = Total Plant Cost**
D = A + B + C as defined below

TOTAL INDIRECT INSTALLATION COST = B

TOTAL CONTINGENCY = C

TOTAL OWNING COST = E + F + G + H + I

TOTAL EQUIPMENT COST = A + B + C = D

TOTAL CAPITAL INVESTMENT = D + E + F + G + H + I

ADJUSTED TOTAL CAPITAL INVESTMENT = TOTAL CAPITAL INVESTMENT – EXISTING EQUIPMENT SALVAGE VALUE + COST OF LOST REVENUES [16]

NOTES:

[1] Total Capital Cost layout is based on the EPA Air Pollution Control Cost Manual - EPA/452B-02-001, 6th Ed. Jan 2002, page 2-6 (pdf file page#20); Tables above include additional cost items found in the stakeholder's Trade Agreement Orders' Cost Analysis Reports and classified into the appropriate cost elements;

[2] The percentage factors recommended by EPA/452/B-02-001 and shown in the above graphical representation of the Total Capital Cost are taken as base factors to perform a leveled cost analysis for the 2010 active Trading Agreements and Orders.

[3] Equipment Procurement Cost lists the Primary NOx Control Device (or System) plus Auxiliary Equipment and Operation Controls (such as water supply and water treatment, instrumentation and major electrical distribution equipment) necessary for operation of the system or to compensate for loss of performance due to NOx control installation.

[4] The items listed are examples of entries, additional items may be added. For example, Annex 2 published by EPA lists the "Major Equipment for an SCR Application".

[5] Taxes and Freight Cost covers applicable sales taxes and shipment to the site of the primary control and its auxiliary equipment. 8% figure suggested by EPA is considered appropriate for this cost analysis, since may equal the 6.35% - CT sales tax plus a freight allocation for items that are not free of shipping.

[6] In general, installing a NOx control system does not require construction of a new building or major alteration of the existing buildings:
- For small (less that 10MW) and medium size (10-200MW) facilities, buildings alterations and civil work may be included as Construction Contracts or Alteration Costs in section (A2) - Direct Installation Cost, and
- For large facilities (such as utility boilers over 200 MW) buildings expenditures would be either listed in section A2 or separately in A3 if the cost is significant.

[7] Per EPA, Site Preparation Costs are only required for grass roots installation. Retrofitting an existing facility, depending on the size and site congestion these costs may be significant for large facilities and therefore would be listed separately in section A4; Otherwise items referring to site should be listed within section A2 - Direct Installation Costs (such as site modification, demolition and clean-up and site finishing) or section B - Indirect installation costs (site survey).

[8] Direct Installation costs include, the labor and materials associated with installing and assembling the primary control and its components. Within this section are listed all construction, mounting, equipment retrofit, relocation and modification work, including cost of bulk parts and accessories (fittings, wiring, pipes, valves, etc.).

[9] Sale Tax and Freight Costs of the direct installation items are in general estimated for each case and included within the cost of the items. The amounts are variable and therefore should not be factored, but rather considered when required and included on a case-by-case basis.

[10] Per EPA-453/R-93-007 - ACT document a 45% of the Equipment Procurement Cost (A1) is typical. However there are specific situations (large facilities or facilities within congested sites) where the retrofit cost (Direct Installation Cost) may exceed the Primary Control Procurement Cost, and therefore should be itemized.

[11] Indirect Installation includes indirect costs associated with installing, startup and initial performance tests of the equipment, as well as contractor and engineering fees (for construction and engineering firms involved in the project). An additional 5% Process Contingency is recommended by EPA for unexpected costs.

[12] Per EPA Air Pollution Control Cost Manual - EPA/452/B-02-001, Indirect Costs can be estimated as factors (multipliers) of Total Direct Cost, especially for cost analysis and budget planning purposes. Typical factors listed above for various subgroups are making up an overall Indirect Installation Cost factor of 20% of Total Direct Cost (A).

[13] Contingencies is a catch-all category that covers unforeseen costs that may arise, possible redesign and modification of equipment, escalation increases in purchase cost, field labor costs and delays encountered in start-up. Sale taxes may be added here if an estimate is not made elsewhere.

[14] Contingency elements may be assessed separately, various engineering firms having different approaches. For instance, in a Trade Agreement Order Cost Assessment Report, Norwich Public Utility indicated a typical 10% of Procurement Cost (A1) in addition to 8% Total Direct and Indirect Installation Costs (A+B). For uniformity EPA's bulk 15% (A+B) was selected for this assessment (EPA/452/B-02-001).

[15] Other Indirect / Miscellaneous Costs include owning (or owner's) costs. These costs are variable being site specific and also depending of the type of control, facility location, etc.
- EPA/452/B-02-001 recommends for Preproduction Costs an overall 2% of Total Direct / Indirect Installation and Contingency (A+B+C).
- All other owner costs may be assessed for each facility. However for a direct comparison of various facilities control cost effectiveness a zero dollar value should be assessed.

[16] If the Cost of Loss Revenues is considered for adjusting the Total Capital Cost, then the Existing Equipment Salvage Value should also be included.

TOTAL ANNUAL COST ELEMENTS' DEFINITION

[1] [2]

TOTAL ANNUAL COST

DIRECT COSTS [5]

VARIABLE COST

1. Raw Material / Reagent	A1		[3]
2. Utilities — Electricity — Fuel — Steam — Water — Compressed Air	A2		[4]
3. Water Treatment / Waste Disposal	A3		[5]
4. Performance Loss / Production Loss	A4		[6]
Total Variable Cost	**A**		

SEMIVARIABLE COST

1. Labor — Operating — Supervisory — Maintenance	B1		[7]
2. Maintenance Materials	B2		[8]
3. Replacement Parts	B3		[9]
Total Semi-Variable Cost	**B**		

INDIRECT COSTS

1. Plant Overhead	C1	60%(B1+B2)	[10]
2. General and Administrative Property Taxes Insurance Administrative Charges	C2	 1% TCC 1% TCC 2% TCC	[11]
3. Capital Recovery	C3	CRF x TCC	[12]
Total Indirect Cost	**C**		

RECOVERY CREDITS

1. Materials	E1		
2. Energy	E2		
Total Recovery Credits	**E**		[13]

NOTES:

[1] Total Annual Cost layout, cost items definitions and estimates or assessment factors are based on following EPA documents:
- SNCR Cost Manual Chapter 1 - Selective Noncatalytic Reduction - 06/05/2015 - Draft for Public Comment, providing a straightforward methodology for utility boliers' SNCR cost based on the latest available data.
- SCR Cost Manual Chapter 2 - Selective Catalytic Reduction - 6/5/2015 - Draft for Public Comment, providing a straightforward methodology for utility boliers' SCR cost based on the latest available data.
- Documentation for EPA's application of the Integrated Planning Model (IPM) v5.13 referring to: Emission Control Technology - Ch. 5, including Utility Boliers' SCR and SNCR Cost Methodology, and Financial Assuptions, Ch. 8.
- EPA Air Pollution Control Cost Manual - Document No.: EPA/452B-02-001, 6th Ed. Jan 2002, including the above graphical representation on page 2-6 (pdf file page #20), and also laying out the basis of controls costs methodologies, including the SCRs procedure used since then in all subsequent SCR cost assessment documentation to the latest 2015 cost updates and IPM tool.
- Alternative Control Techniques Document - NOx Emissions from Stationary Gas Turbines - EPA ACT Document No.: EPA-453/R-93-007, Jan 1993, providing methodology, cost factors and guidlineds for assessing annual cost of the Water Injection controls and SCR applied to combustion turbines.

[2] The above graphical representation and EPA's assessment factors of various cost items may be used to perform a leveled cost analysis for air controls RACT assessment. In general, specific factors/multiplies for various items included in the above graphical representation, first proposed in ACT documents and in the 2002 Cost Manual remain unchanged in the latest cost manual revisions and in IPM; only specifc costs of water. electricity, reagent, and other similar have been updated. However, if data is not available, an old year specific cost $$ amount may be used and the result should be corrected for a current year using Consumer Price Index (CPI) published by the U.S. Department of Labor, Bureau of Labor Statistics, http://www.bls.gov/data/inflation_calculator.htm

[3] If the variable direct annual cost account for purchase of a reagent (A1) is small, such as water (for HPWI systems), it may not be considered; However ammonia or urea costs should be included. The latest update of cost manual includes reference to such costs.

[4] Utilities also may account; If available, the current values should be used in lieu of the EPA proposed values. Data available for equipemnt operating half time or other period less than full year should be adjusted to entire year. In addition the result should be corrected for a current year using the Consumer Price Index (see note 2, above).

[5] For combustion turbines, if current data is nor available, water treatment for HPWI cost may be estimated using ACT - EPA-453/R-93-007, page 6-226; Also combustion turbines' catalyst disposal cost may be assessed using EPA proposed methodology in ACT - EPA-453/R-93-007, page 6-238.

[6] Performance loss is calculated for combustion turbines per Ref. 2 - EPA-453/R-93-007, page 6-238.

[7] Labor cost is determined per Ref. 2 - EPA-453/R-93-007, page 6-238. Supervisory costs accounts for 15% of operating hours. Since per Ref. 2 - EPA-453/R-93-007 proposed a Maintenance factor based on a small turbines, the cost factor is assumed to be included in the maintenance materials.

[8] Maintenance materials cost and maintenance labor can be determined using factor proposed per EPA/452B-02-001. page 2-45 as a fraction (1.5%) of TCI and adjusted to actual operating hours vs. 4000 hrs per document example.

[9] Replacement parts may be significant for SCR's only. For utility boilers it can be used the methodology outlined in the latest revision of thge cost manual (note 1). For cobustion turbines use data from 2002 cost manual - EPA/452B-02-001. page 2-50, considering a 1998 cost factor, adjusted with Inflation factor (CPI) and a Capital Recovery Factor (CRF) calculated based on replacement cycle Y = (24,000 / Yearly Operating Hours). The cost is negligible if Y is more than 40 years.

[10] Indirect Overhead cost factor is proposed to 60% labor and maintenance materials without including replacement parts cost, per EPA documents listed in note 1.

[11] General and Administrative, property, insurance and other administrative charges) may be calculated together as 4% of TCC. Note the TCC should not include retrofit and other higher costs due to congested sites, EPA estimates did not included these conditions;

[12] Capital recovery accounts for more than 70% of the total annual costs and is a fraction of the TCI adjusted by the CRF. For Capital Recovery assessment, TCI should include the retrofitting and other additional costs

[13] For Connecticut's TA&O units recovery credits are considered negligible

Air Pollution Control Costs – List of Principal References

- **SNCR Cost Manual: Chapter 1 - Selective Noncatalytic Reduction - 6/5/2015 - Draft for Public Comment.**
  http://www.epa.gov/ttn/ecas/models/SNCRCostManualchapter_Draftforpubliccomment-6-5-2015.pdf
- **SCR Cost Manual: Chapter 2 - Selective Catalytic Reduction - 6/5/2015 - Draft for Public Comment.**
  http://www.epa.gov/ttn/ecas/models/SCRCostManualchapter_Draftforpubliccomment6-5-2015.pdf
- **Documentation for EPA's application of the Integrated Planning Model (IPM) v5.13,**
  http://www2.epa.gov/airmarkets/power-sector-modeling-platform-v513
  http://www2.epa.gov/airmarkets/documentation-base-case-v513-emission-control-technologies
  including:
  - **Chapter 5: Emission Control Technologies**
  - **Attachment 5-3: SCR Cost Methodology**
  - **Attachment 5-4: SNCR Cost Methodology**
  - **Chapter 8: Financial Assumptions**
- **EPA Air Pollution Control Cost Manual - Document No.: EPA/452B-02-001, 6th Ed. January 2002**.
  http://www3.epa.gov/ttncatc1/dir1/c_allchs.pdf
- **Alternative Control Techniques Document - NOx Emissions from Stationary Gas Turbines – EPA ACT Document No.: EPA-453/R-93-007, January 1993,** http://www3.epa.gov/ttncatc1/dir1/gasturb.pdf
- **Alternative Control Techniques Document - NOx Emissions from Utility Boilers - EPA ACT Document No.: EPA-453/R-94-023, March 1994,** http://www3.epa.gov/ttncatc1/dir1/utboiler.pdf
- **Alternative Control Techniques Document - NOx Emissions from Stationary Reciprocating Internal Combustion Engines EPA ACT Document No.: EPA-453/R-93-032, July 1993**
  http://www3.epa.gov/ozonepollution/SIPToolkit/ctg_act/199307_nox_epa453_r-93-032_internal_combustion_engines.pdf

DEEP Methodology Outline

- A cost assessment method will be developed for each of the following types of air pollution controls:
  - SCR
  - SNCR
  - Water Injection
  - Combustion Control

  <u>Note:</u> Other controls may be considered

- The methodology will follow the EPA's approach to assess the cost effectiveness of the air pollution controls, developed during several years and found in multiple documents.

DEEP Methodology Outline

- The EPA methodology is described in detail in 2002 EPA Air Pollution Control Cost Manual
- The two 2015 Cost Manuals, published on June 6, as well as the Integrated Planning Model (IPM) v5.13 include a "condensed/compact" version of the 2002 methodology; only the "$ values" of various cost elements were updated.
- Unfortunately the 2015 revisions are limited to SNCR and SCR for utility boilers on coal, oil & natural gas, only.

DEEP Methodology Outline

- The 2002 Air Pollution Control Cost Manual includes a detailed version of the 2015 SNCR and SCR methodology, applicable to utility boilers as well as to combustion turbines.
- Water Injection Systems have not been updated for years. The only available data are found in Alternative Control Techniques (ACT) documents from 1993-94. Consequently a method similar to the other controls should be developed, using available data

Conclusions

- The DEEP methodology will be developed based on the EPA's approach to assess the cost effectiveness of the air pollution controls, developed during several years.
- The methodology is necessary for Case-by-Case RACT Demonstrations.
- The proposed methodology establishes a uniform cost analysis and cost effectiveness determination, and will put everyone on a level basis.
- The presentation provides an introduction to the type of information needed for Case-by-Case RACT demonstrations.
- The method will be released shortly for you to review.

Questions?

For any questions or concerns , please contact:

Daniel Vesa, P.E.
Air Pollution Control Engineer
Stationary Sources Control Group
Daniel.Vesa@ct.gov
(860) 424-3282