Reduced Engine Idling at Truckstops: Drafting a Declaration of Cooperation

January 2005

Oregon Solutions Project Convener:
Gail Achterman, Director
Institute for Natural Resources, Oregon State University

Project sponsor:
Oregon Department of Environmental Quality,

- Stephanie Hallock, Director
- Paul Slyman, Deputy Director

Purpose:

The purpose of our Oregon Solutions project is to reduce diesel engine idling at commercial truckstops in Oregon starting with the I-5 corridor.

This project will promote fuel savings and reductions in air pollution and carbon dioxide emissions by supporting the development of diesel truck idling reduction infrastructure. The Project Team will work to reduce diesel engine idling statewide by initially focusing collaborative efforts with truckstops along the I-5 corridor.

Preface

In 2003, Governor Theodore Kulongoski launched, with the Governors of California and Washington, the West Coast Global Warming Initiative to address the issue of climate change and ultimately outlining strategies and projects to curb greenhouse emissions. Reducing long duration idling at truck stops was identified as one effective measure to reduce carbon dioxide emissions. The Reduced Idling Truckstops project was designated an Oregon Solutions project by Governor Kulongoski in April 2004 to ensure successful implementation in Oregon. The Governor has assured participation of his staff and appropriate state agencies with other partners through the designation of this effort as an Oregon Solutions project.

It is expected that the creation of an Oregon Solutions Team for this project will:

- help make efficient use of available resources,
- accelerate the pace of the project,
- overcome potential impediments early on, raise awareness of the project on a statewide level and
- bring effective partners to the table.

In this fashion the Team will commit resources and time to develop and implement an integrated action plan focused on reducing diesel emissions and fuel consumption.

The Project Team's general principles and ground rules for conducting business with one another are included in Attachment A.

Background Information

Continuous idling of large diesel truck engines for cab space conditioning and engine warming is costly to truck owners and operators, both in terms of fuel use and engine wear. Unnecessary idling is also wasteful of our nation's energy supplies and damaging to our environment. Nationally, fuel consumed by idling represents about 1% of all imported petroleum. Idle reduction technologies such as Truck Stop Electrification (TSE) represent a clear example of a "win-win" situation for all involved stakeholders – truck owners and operators, truck stop operators, and the public as a whole.

However, widespread implementation of TSE has been characterized as being subject to the "chicken and egg" syndrome. Truck stop operators hesitate to install TSE infrastructure without reasonable assurances of a user base; truckers won't install necessary ancillaries or hook-up interfaces without an available TSE infrastructure to provide related services. Public policy and benefit organizations, including State and Federal government groups, seek to facilitate, and even possibly sponsor early-stage TSE projects, but are lacking a complete understanding of market needs, constraints and market insights regarding the most effective ways of leveraging their often-limited resources.

The National Association of Truckstop Owners has stated a "posture" on idle reduction technologies. It states, in part, "the linchpin that will unlock the gate to widespread idle-free parking is an integrated and unified effort on the part of all stakeholders. Ultimately, success in idle reduction will require a collaborative approach by travel plaza operators, after-market providers, utilities, original equipment providers, trucking fleets, and appropriate state and federal agencies."

This Oregon Solutions Team is intended to be a means to address these challenges by bringing together the private sector trucker and truck stop operators with the public sector groups who wish to help transform the market by sponsoring, offering incentives, or otherwise encouraging the installation and use of TSE as an alternative to engine idling. Other alternatives to reduce the need to idle include outfitting the trucks with auxiliary power units (APUs) or other devices to provide onboard heat, air conditioning and power. While these alternatives are certainly a more efficient and less polluting way to provide

the services the trucker needs other than idling the main truck engine, the Team will focus on TSE because a site based approach guarantees the benefits are accrued in the state and is ultimately less expensive. Nonetheless approaches supporting APUs are certainly complementary to TSE efforts as trucks will continue long duration idling at locations other than truck stops. In fact, the Lane Regional Air Pollution Authority is developing a nationally recognized program to support APU installation on trucks operating in Oregon, which underscores the comprehensive approach that is possible in the state. More information about this project can be found on the web at: http://www.lrapa.org/public_education/downloads/july_sept_04_newsletter.pdf.

The Oregon Solutions Project Team members (Attachment B) recognize that providing reduced idling at truckstops will have social, environmental and economic benefits. While trucks play a vital role in the Oregon economy, the engine idling that typically occurs during driver rest periods represents energy consumed inefficiently to provide needed services to the driver along with resulting air pollution and global warming impacts. Supplying energy from the grid as opposed to idling the truck engine is about 90% more efficient with comparable reductions in pollution. For instance, Oregon has slightly over 5,000 commercial truck parking spaces. If idling at these locations were able to be eliminated then reductions of regulated air pollutants (hydrocarbons, particulate matter, carbon monoxide and nitrogen oxides) achieved would be on the order of 8,000 tons per year and carbon dioxide by 250,000 metric tons. Beyond the environmental benefits, there would be savings to truck operators of about $18 million every year and fuel consumption reductions of almost 30 million gallons. Attachments C and D provide background information about these potential savings.

The project will focus on commercial truck parking facilities because federal law prohibits providing services at public rest areas along the interstate highway system that compete with private operations. The initial focus will be on Interstate 5, as the main truck freight corridor in the state, but the Team recognizes that there is a similar need along other freight routes in the state, e.g., Interstate 84 and Highway 97.

In September of 2004, EPA, through their Smart Way Transport program awarded $200,000 to Oregon State University (OSU) to implement a truck stop electrification project, primarily focusing on the Interstate 5 corridor. OSU, through the Kiewit Center for Infrastructure and Transportation, will lead the project along with The Climate Trust and the Department of Environmental Quality in consultation with the Oregon Solution Project Team. The project proposes to fund "electrification" of 600 commercial truck parking spaces in the corridor using a combination of funds from carbon dioxide offsets, Oregon Business Energy Tax Credits, low interest energy loans and match contributions from technology providers as well as other funding sources that may be identified through the work of the Team. A truckstop prioritization process will begin in the fall of 2004 along with a solicitation for project proposals. Projects are anticipated to be selected and contracts negotiated and signed by June 2005. Construction may begin soon afterwards with all sites completed by July 2006. Monitoring and evaluation of the effectiveness of the installations, particularly on nearby communities, will be completed by August 2007. This is outlined in an implementation plan included as Attachment E.

Commitments for Reduced Idling at Truckstops

These commitments represent a public statement of intent to participate in the project, to strive to identify opportunities and solutions whenever possible, to contribute assistance and support within resource limits, and to collaborate with other Team members in promoting the success of the project.

The OS Project Team agrees to provide project policy oversight and to engage in efforts to enhance project visibility and acceptance.

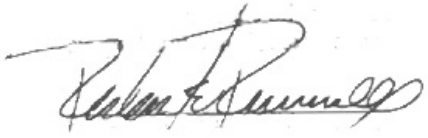
The following commitments to the success of the project are made by the Project Team:

Oregon Trucking Associations and Participating Trucking Companies and Truck Stops

The Oregon Trucking Associations and representative trucking companies and truck stops support reducing idling of heavy truck engines at commercial truck stops in Oregon. We support idle reduction as a major contribution toward air quality improvement and as an important step in conserving energy resources. We will work to support the Project Team's integrated and unified efforts to implement reduced idling projects that:

- Better protect Oregon's environmental quality, and specifically projects that result in measurable improvements including reductions in green house gas emissions.
- Recognize the value of trucking to the economy, and will maintain or enhance truck drivers' quality of life on the road.
- Are sustainable and will:
    - provide positive economic incentives for truck operators without the need for continuing subsidies.
    - provide a reasonable return to truck stops.

We will encourage others that are not initially a part of our Project Team to voluntarily support and contribute to our efforts.



Oregon Trucking Associations

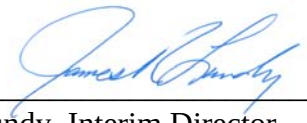
Jubitz Travel Center

Coburg Truck 'n' Travel

May Trucking Co.

Oregon State University – The Kiewit Center for Infrastructure and Transportation

- Administer EPA Idle Free Corridor Project grant to include the following steps:
  - Develop a system for evaluating deployment locations.
  - Survey affected communities to assess the effectiveness and acceptability of new technologies.
  - Administration, accounting and reporting requirements of the EPA grant.



1/10/2005

Jim Lundy, Interim Director Date

Oregon State University – The Institute for Natural Resources

- Coordinate project development and implementation with research to assure that the research results inform future truckstop electrification efforts.

1/11/2005

Gail Achterman, Director Date

Climate Trust

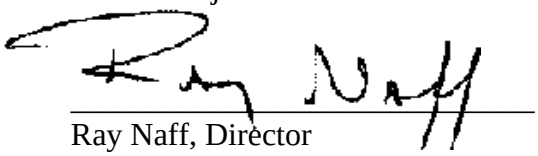
- Administer an Idle Free Corridor Project to include the following steps:
  - Conduct a competitive solicitation process to identify at least 3 truckstops locations on the I-5 corridor to build reduced idling demonstration projects.
  - Post the Request for Proposal and related information on the web.
  - Negotiate contracts with the selected facilities.
  - Spend up to $2M in carbon dioxide offset funding for 600 parking spaces contingent upon the continued availability of funding, and their meeting Climate Trust offset criteria and price per ton threshold.
  - Provide regular updates to the Project Team as a part of project implementation.

1/6/05

Mike Burnett, Executive Director Date

Governor's Office and the Economic Revitalization Team

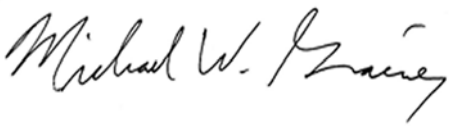
- The Governor's Office can assist the project in a number of ways. The Governor and his staff have already provided letters, contacts and other assistance. We will continue to assist the project by requesting state agencies to address issues and requests presented by the project, and helping to assure that appropriate parties involved with other activities that may affect the Project are coordinated with the Project Team.



Ray Naff, Director — Date: 1/13/05

Oregon Department of Energy

- Provide technical and financial support to include cost sharing for idle reduction projects through:
  - The Business Energy Tax Credit.
  - The State Energy Loan Program.
- Provide objective information on cost savings of the various idle-reduction technologies for drivers and fleets.



Michael W. Grainey, Director — Date: 12/20/04

Department of Environmental Quality (language under final review)

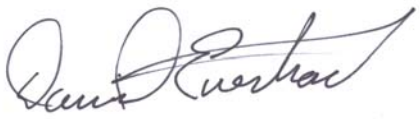
- The Department will provide staff support and technical assistance to the project including:
  - Providing technical information to the Team;
  - Working to draft agreements;
  - Coordinating and tracking project implementation and outcomes; and
  - Modeling of air quality benefits at selected sites where truck idling infrastructure has been installed.

Paul Slyman, Deputy Director — Date: 1/19/05

Idleaire

- IdleAire Technologies supports implementing truck stop electrification projects that provide all services (including heating and air conditioning) necessary for any long-haul driver to stop idling in Oregon under the solicitation process to be developed with input from the Project Team. For this project, IdleAire will provide all cost above $10,000 for each parking space equipped with IdleAire's Advanced Travel Center (truck stop) Electrification system, subject to a 50-space minimum at each location, applicable contracts with the location owner and required permits.

- If selected, IdleAire will provide the following support: (1) the installation, operation and maintenance of its comprehensive, patented Advanced Travel Center Electrification (ATE) ShorePower system, including, but not limited to, electrical shore power connections inside and outside the cab, filtered heating & air conditioning, a Pentium-speed computer with color touch screen, unlimited Internet and E-mail access, satellite television, a phone connection, movies on demand, and Ethernet and wireless Internet connections; (2) Up to 1,000 free window adapters, the only truck retrofit required for any long-haul truck to utilize the system, at each ATE installed site in Oregon as part of this project; (3) a free visit for each first-time user or other incentives consistent with IdleAire's national policy at the time; (4) free onsite education and training 24/7, (5) a free 24/7 help desk; (6) a turnkey onsite and offsite driver and fleet marketing program to ensure optimal use; and (6) IdleAire will provide technical assistance in the utilization of Federal Highway Administration CMAQ (Congestion Mitigation and Air Quality Improvement Program) for such additional ATE electrification projects based on the company's previous successes in other states.



1/18/2005

David Everhart,
COO

Date

Shurepower

- Shurepower supports implementing a truck stop electrification project in Oregon under the solicitation process to be developed with input from the Project Team. Shurepower will provide a cost share or discount of $1,000 per electrified truck parking space to Oregon for this specific project. The cost share will be limited to $100,000; and may be extended or increased at our option based upon the total number of connections procured.

- Shurepower can additionally provide on-site promotions and marketing, service and maintenance, call center support, general marketing and outreach activities, and at least one month of complementary services to drivers to promote system utilization. We may also be willing to provide up to 100 basic shore power connection kits valued at $300 apiece.

Michael T. Panich, P.E. — Date: 1/6/05
Chief Operating Officer

Oregon Department of Transportation (approved language 12/04)

- The Oregon Department of Transportation (ODOT) can support the project in a number of ways. ODOT commits to provide technical assistance to the project including consideration of:
  - how reducing idling at rest areas can also be accomplished in a manner that complements this effort,
  - whether funding may be available from the state infrastructure bank or other transportation related sources to help finance this project,
  - distribute Project information to Area Commissions on Transportation to consider,
  - review the use of Federal Highway Administration CMAQ funds (Congestion Mitigation and Air Quality Improvement Program) in Oregon and how they can be committed to idle reduction technologies.
  - provide pertinent information on truck traffic and related regulations to Team members and other interested persons.

Bruce Warner, Director — Date: 1/18/05

Oregon Economic and Community Development Department

- The Oregon Economic and Community Development Department administers a number of financial programs that may support the initial investment required to reduce idling at truckstops. The Department will continue to track the project and seek ways to leverage its programs for this purpose.

Marty Brantley, Director — Date: 1/12/05

Lane Regional Air Pollution Authority

- Lane Regional Air Pollution Authority will provide staff support and technical assistance for any reduced idling truckstop project to be built within Lane County. LRAPA will also continue our efforts to promote and assist in financing the installation of auxiliary power units on any eligible truck.

Manager of Administration & Planning Date

U.S. Environmental Protection Agency

- EPA, through its efforts to develop, support and grow diesel emission reduction efforts across the country but especially in the west coast states of Oregon, Washington, Idaho, and California, will provide technical and financial support (subject to appropriations) for truck idling reduction projects.

Peter Murchie, EPA, Region10 Diesel Team Lead Date

Oregon Rural Electric Cooperative Association (proposed language)

- We will make information about this project available to our not-for-profit, consumer-owned electric cooperative utilities providing service to private truckstops across the state.

Jack Evans Date
Manager of Regulatory & Technical Affairs

PacifiCorp

We agree to support the Oregon Solutions Reduce Idling at Truckstops project with:

- Technical assistance in identifying electrical service interconnects that may be necessary for project implementation.
- Supply of data related to air emissions associated with supplied power for calculation of emissions reductions and offset credits.
- Identification of renewable power options for identified projects and promotion of renewable power use.
- Project promotion and awareness through communications to customers (i.e. bill inserts or other appropriate means) for projects located in our service territory.

February 10, 2005

_____ _____

Bill Edmonds Date
Director, Environmental Policy Date

OTHER TEAM MEMBER AGREEMENTS:

- Utilities
- Businesses, consultants

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(SPACE HELD FOR TEAM DEVELOPMENT OF IMPLEMENTATION PLAN AND PROJECT CHECK POINTS AFTER COMPLETION OF THE DECLARATION.)

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Attachment A

Reduced Idling Truckstop Team Member Ground Rules

The Project partners in the Oregon Solutions process are committed to the following "ground rules" for how they conduct their business with one another in this collaborative process. These ground rules will guide the process of achieving an integrated solution and the creation of a declaration of cooperation.

As discussed at the 9/13/04 team meeting:

General Principles

- We agree to approach problems with humility and adaptability. We will inevitably make mistakes and we will learn from these mistakes, make corrections, and not place blame.
- We recognize that we each have a unique perspective and contribution to make, whether it is expertise, labor, money, in-kind services, etc.
- We recognize that we must endeavor to involve any person or group who could help or hinder us to achieve our goals.
- We agree to focus on taking incremental "do-able" steps towards success.

Ground Rules

1. We recognize that the best outcome depends upon cooperation and collaboration by all entities at the table.
2. We commit to openly communicate ideas, potential contributions, and concerns, and also commit to engage in respectful, active listening to each other.
3. We are willing to creatively explore solutions.
4. We agree to commit to the agreed-upon solution, in whatever way we can. If we, individually, are unable to make a commitment for our organization, we will work to identify the person that can and determine if the commitment is possible.
5. We commit to building trust by doing what we say we will do, over and over, and seeking solutions instead of placing blame.
6. We agree to notify each other before taking outside actions that might impact the process. (This does not mean that we will provide information that it would be inappropriate to share in a public venue.)
7. We agree that everyone shares in the solution, everyone shares in the credit.
8. The convener and project staff commit to ensuring that this process does not result in "just a bunch of meetings" by documenting agreements at the end of each meeting.

Attachment B

Oregon Solutions Project Team

Project convener:		
Gail Achterman, Institute for Natural Resources	503 725-3099	Gail.Achterman@oregonstate.edu
Project Team members:		
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Don Caniparoli, CH2M Hill	503 235-5022 x4320	don.caniparoli@ch2m.com
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Jack Evans, OR Rural Electric Coop Assoc	503 393-0180	jevans@oreca.org
Erica Graetz, Climate Trust	503 238-1915	egraetz@climatetrust.org
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Bob Russell, Oregon Trucking Association	503 513-0005	russell@ortrucking.org
Eric Simpkins, Idatech	541 383-3390	esimpkins@idatech.com
Paul Slyman, ODEQ	503 229-5078	slyman.paul@deq.state.or.us
David Temple, May Trucking	503 393-7030	davidt@maytrucking.com
David Van't Hof, Governor's Office	503 986-6534	david.vanthof@state.or.us
Oregon Solutions staff:		
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Kevin Downing, DEQ	503 229-6549	downing.kevin@deq.state.or.us

Attachment C – Cost Comparison

All idle-reduction technologies have the potential to save drivers and fleets thousands of dollars per year. "Stationary" technologies like Shurepower TSE and IdleAire Technologies provide the driver with grid based power and may include other amenities such as cable television, Internet and phone connections. Power connections are used for heating ventilation and air conditioning systems, televisions, DVD players, computers, coffee makers, microwaves, power tools and lights. "Mobile" technologies, otherwise known as auxiliary power units, can also provide heat, cooling and electricity.

Shurepower TSE™

Shurepower™ has developed a comprehensive, commercial shore power product for the trucking industry to reduce truck tractor idling. Shurepower™ offers the truck stop stationary infrastructure as well as the on-board tractor equipment to connect to shore power. Shurepower™ services include 120-VAC power, 240-VAC power, Internet, WiFi, local telephone and cable television. Shurepower TSE requires some on-board equipment such as an electric HVAC system.

IdleAire Technologies

Unlike traditional truck stop electrification (TSE), IdleAire erects a structure above the parking spaces where a concentric hose and integral cabling connects the HVAC to a computer-powered service delivery module, which fits into the cab window. The module delivers heat and air conditioning, 110-volt outlets inside and outside the cab, internet, local telephone service, satellite television, movies on demand and computer-based interactive driver training to the cab of the truck. Company installs, operates and maintains equipment at no capital cost to property owner.

Auxiliary Power Units (APU)

Auxiliary power systems are completely mounted on the vehicle; therefore, they can be used independently of any land-based connection. Auxiliary power systems can use a small engine to provide heat, cooling and electricity. Auxiliary power systems can also be powered by an auxiliary deep cycle battery pack.

Individual savings are dependant on average annual idling hours, diesel fuel prices, fuel consumption rates, and the actual number of idling hours that will be avoided or displaced. In this comparison, Shurepower, IdleAire and an APU will be compared for relative cost savings to the end user. However, individual technology choices should be made based on the utilization characteristics of the driver.

Initial Capital Investment

Shurepower – Level 1 …… $189
Shurepower – Level 2 …… $2,500
APU ……..... $7,000
IdleAire ……..…….. $10

Hourly Costs (Does not include capital cost)

Shurepower TSE…… $0.75
APU …… $0.40
IdleAire ……$1.25

Other Assumptions for Calculations

Diesel fuel cost …….. $ 2.00/gal

Idling fuel consumption rate[1] ……..... 1.0 gal/hr
APU fuel consumption rate[2] …… 0.15 gal/hr
APU Maintenance cost ……..... $ 0.10/hr
Idling hours per year[1] …… ……. 1,800 hrs
Lifetime/Investment cycle …… 5 years

TOTAL 5-YEAR COSTS*

Idling
= 1800 gal/yr x $2/gal x 5 yrs…… **$18,000**
Shurepower
= $2,500 + ($0.75 x 1800) x 5 yrs …….. **$ 9,250**
APU
= $7,000 + ($0.40 x 1,800) x 5 yrs..…… **$10,600**
IdleAire
= $10 + ($1.25 x 1800) x 5 yrs …… **$11,260**

Total Savings

Shurepower TSE ……..…….... $ 8,750
APU …… $ 7,400
IdleAire …… $ 6,740

Total Average Hourly Cost
Idling …….. $2.00
Shurepower TSE..…… $1.03
APU …… $1.18
IdleAire …….. $1.25

***The above calculation assumes a 100% utilization rate. In others words, it is assumed that "all" idle hours would be replaced by each individual technology.

Calculations do not consider engine wear, service and maintenance, or parts replacement due to engine idling for all of the technologies. The residual value of on-board components was also not considered. These factors would increase the overall savings from idle-reducing technologies and reduce payback times.

[1] UC Davis
[2] Rigmaster

Attachment D

Valuation of benefits from truck stop electrification

Many of the benefits from using truck idling mitigation technology at truckstops can be evaluated economically. This includes benefits to the vehicle owner such as reduced fuel consumption and reduced wear and tear on the engine. In addition there are public health and environmental benefits, some of which can also be estimated monetarily. The Argonne National Laboratory developed a methodology to estimate the benefits to truck operators from reduced truck idling and the Environmental Protection Agency in the supporting documents for the 2007 truck engine rule provided a basis for estimating the public health and environmental benefits of reduced exposure to diesel exhaust.

Benefits to trucking community

The Argonne National Laboratory has developed a calculator (http://www.transportation.anl.gov/research/technology_analysis/idling.html) that allows a user to determine the cost of idling, both in terms of fuel cost and wear and tear on the engine. In this instance, the assumed rate of fuel consumption was 1 gallon per hour of idling at $1.70 per gallon. Estimates of utilization of truck idling equipment came from an analysis by Idleaire (approximately 14 hours a day). The benefits to the trucking community also discounted the costs to connect to the idle reduction systems bringing net benefit per day to $8 per space.

Benefits to the community at large

When the Environmental Protection Agency developed its rules for heavy duty diesel truck engines beginning with the 2007 model year the agency also prepared a cost-benefit analysis. In that analysis staff considered a number of human health and welfare impacts associated with diesel particulate and nitrogen oxide emissions, the pollutants for which controls were proposed in the rulemaking. These health and welfare effects included premature mortality, chronic bronchitis, emergency room visits for asthma related treatment, asthma attacks, acute bronchitis, upper and lower respiratory symptoms, work loss days, minor restricted activity days and hospital admissions related to chronic obstructive pulmonary disorder, pneumonia, asthma and cardiovascular episodes including cardiac dysrythmias, as well as reduced visibility in recreational areas and agricultural crop damage. The rulemaking documents estimate that the annual monetary benefit of the reduction of diesel exhaust emissions amounted to about $70 billion per year. Since the benefit was calculated in 1999 dollars the analysis is also a portrayal of the contemporary impact associated with exhaust from diesel engines under the current certification standards. In order to use this data to assess more localized impacts and evaluation of mitigation strategies one can assume that the impact from diesel exhaust is directly related to the fuel consumed. To determine this metric the impact cost is divided by total fuel consumption in 1999. The result is that each gallon of diesel fuel consumed in highway engines contributed approximately $2.10 toward the total impact.

Every gallon of diesel fuel not consumed by idling reduces the overall impact. Each space fitted with idle reduction technology may result in about 5,300 gallons of fuel saved per year with a resulting public health and environmental benefit per space of $11,000.

The EPA analysis does acknowledge uncertainties in its estimate but accounts for most of those in making the final determination of economic benefits assigned to the rule. It should be noted that, for purposes of this particular analysis, that the EPA estimate may be characterized as conservative for two reasons. The first is that the target year for benefit valuation is 2030 but EPA acknowledges that even by that time not all on road vehicles will be in compliance with the 2007 standard, so the estimated benefit would be higher with all engines in the current fleet mix removed or treated. EPA also acknowledged that there are other significant health and welfare effects that were not monetized in its analysis including, most notably, cancer.

Attachment E

Implementation Plan
Working Document as of 1/2005

January 2005	Release Climate Trust *Truckstop Electrified Parking CO2 Offset Solicitation*
January 19 2005	Climate Trust Bidders Conference: Meeting with conference call capabilities. This is an opportunity to ask questions about the RFP and the selection and contracting process.
February 16	Project proposals are due to The Climate Trust.
	The Climate Trust will acknowledge receipt of proposals by e-mail.
February - April	Climate Trust staff reviews proposals with their Offset Committee and Board of Directors. If approval is given, Climate Trust staff can move to negotiation stage with selected projects.
April	Oregon Solutions Project Team meeting to assess status
April - June	Contract negotiations with the submitters of selected proposals.
June 30, 2005	Targeted date for contract signatures with The Climate Trust.
Summer – Fall	Construction starts at selected truckstop locations.
September 2005	Tentative date for Project Team meeting to review RFP outcomes, construction status and next steps.

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