MISSOULA MONTANA: INVERSION CONDITIONS

(From Wood 'n' Energy, October 1986)

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GLOSSARY OF TERMS

ANPR -	Advance Notice of Proposed Rulemaking
AS -	Air Stagnation
BACT -	Best Achievable Control Technology
BaP -	Benzo(a)pyrene
BATNA -	Best Alternative to a Negotiated Agreement
BDT -	Best Demonstrated Technology
BTU -	British Thermal Unit
CAA -	Clean Air Act (42 U.S.C. 7401 et seq.)
CASAC -	Clean Air Scientific Advisory Committee
CMB -	Chemical Mass Balance
CONEG -	Coalition of New England Governors
EAB -	Economic Analysis Branch, OAQPS, EPA
EPA -	U.S. Environmental Protection Agency
ESED -	Emission Standards and Engineering Division OAQPS, US EPA
g -	Grams
HAP -	Hazardous Air Pollutant
HC -	Hydrocarbons
HI -	High Impact
J -	Joules - a unit of heat
kg -	Kilograms
NAAQS -	National Ambient Air Quality Standard
NAPCTAC -	National Air Pollution Control Techniques Advisory Committee
NCP -	Nonconformance Penlal
NESHAP -	National Emission Standard for Hazardous Air Pollutants
NO_x -	Oxides of Nitrogen
NO_2 -	Nitrogen Dioxide
NRDC -	National Resources Defense Council
NSPS -	New Source Performance Standard
OAQPS -	Office of Air Quality and Standards
OMB -	Office of Management and Budget
PM10 -	Particulate Matter less than 10 micrometers diameter
POM -	Polycyclic Organic Material
Reg-Neg -	Regulatory Negotiation
RWC -	Residential Wood Combustion
SIP -	State Implementation Plan
STAPPA-ALAPCO -	State and Territorial Air Pollution Program Administrators-Association of Local Air Pollution Control Officers
TSP -	Total Suspended Particulates
ug -	Micrograms
WHA -	Wood Heating Alliance

RESIDENTIAL WOOD COMBUSTION EMISSIONS: THE DEVELOPMENT OF A NEGOTIATED REGULATION

Introduction

As I write this introduction, EPA and interested parties are near culminating what, if successfully implemented, will be the first truly negotiated new source performance standard (NSPS). When I began my investigation into the residential wood combustion (RWC) emissions problem in early 1985, EPA had been less actively investigating the subject for at least ten years. One EPA employee at that time felt it would be 15 years before EPA set a RWC-NSPS. My initial investigations and recommendations for action were based on the traditional "safe track" approach EPA has adapted to avoid court and/or internal challenges. My recommendations had followed basically a national ambient air quality standard (NAAQS) approach to the RWC emission problem and had called for an improved and centralized data base for RWC NAAQS contribution as well as calling for a coordinated EPA and state research and development (R & D) program for stove improvement and testing procedures.

There were forces at play, however, that would cause EPA to amend its usual rulemaking procedures. By May 1985 EPA's Office of Air Quality Planning and Standards (OAQPS) had in fact already submitted an Advance Notice of Proposed

Rulemaking (ANPR) for high level EPA review. When the notice was published in the Federal Register in August 1985, it announced that EPA would seek an expedited rulemaking which would result in a regulation "two years sooner than under the Agency's traditional standard-development process" (Federal Register, August 2, 1985, p. 31505) and a good deal sooner than many would have anticipated.

EPA's RWC interest had reportedly been accelerated when Assistant Administrator for Air and Radiation, Joseph A. Cannon, was introduced to Missoula, Montana emissions by Senator Max Baucus on a particularly bad inversion day in the winter of 1984. Cannon promised to look into the issue and set up a wood smoke advisory committee. The call for an expedited NSPS, however, went beyond the recommendations that the wood smoke committee reported to Cannon in November of 1984. Although there was no mention of it in the ANPR, EPA was in fact already engaging in court negotiations concerning polycyclic organic material (POM) emissions, RWC being the major source.[1] Although the final

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[1]The State of New York and NRDC brought suit in August 1984 for EPA's failure to regulate POM, a large class of often carcinogenic material. Agreement was reached after eighteen months of out of court negotiations. The final ruling required EPA to propose standards for wood smoke emissions no later than January 1, 1987 and promulgate standards by January 1, 1988 (NRDC 1986). (The ruling also required EPA to propose a schedule for regulating waste incinerators and to study toxic emissions from fossil-fueled boilers. Diesel exhaust, the remaining large source of POM is addressed in another NRDC suit.)

ruling[2] was not filed until May 1986 , EPA had already agreed to consider the NRDC's suggestion that EPA employ mediated negotiations with the Wood Heating Alliance (WHA), a woodstove industry voice, and other interested parties in order to promulgate an RWC regulation in the shortest reasonable time period.

As pointed out by Conservation Foundation principal Gail Bingham (Bingham, 1986), mediation may not always be the best way to handle environmental disputes. There are, however, many aspects of the RWC emission scenario which seem to lend themselves to this method.

This paper has five purposes:

(1) To report on the technicalities of the RWC emission issue.

(2) To enumerate the various factors which must be considered in an RWC emission regulation.

(3) To report on the use of regulatory negotiation, and how this ditfers form normal EPA rulemaking procedures.

(4) To show how negotiation is particularly applicable to an RWC regulation.

(5) To examine the thesis that a negotiated regulation was an appropriate alternative by reporting on how

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[2]State of New York v. Lee M. Thomas and Natural Resources Defense Council (NRDC) v. Alvin L. Alm, First Federal Circuit Court, 1984.

various specific issues were resolved in the six regulatory negotiation (reg-neg) committee meetings held monthly from March to August 1986.

Chapters 1 and 2 present the background of the RWC emission problem and the attempts by various states and localities to find solutions. Chapter 3 examines these solutions and how they affect the different concerns introduced in chapter 1. It also presents a model for decision analysis that could be used (with refinement) for optimizing an RWC strategy. Chapters 4 and 5 introduce the concept of environmental mediation and describe EPA's growing interest in regulatory negotiation or, more specifically, negotiated rulemaking (see footnote 10, p. 83). Chapter 6 explains how RWC emission regulation is a suitable candidate for negotiated rulemaking. An analogy is drawn with the multi-objective decision analysis described in chapter 3 showing how mediation is a logical forum to formulate an optimal solution - in this case an NSPS - when affected parties have differing agendas - i.e. multiple objectives. Chapters 7 and 8 describe the preparations and the negotiations both chronologically and by issue. It is intended that the reader may gain a sense of the negotiation process itself - how positions developed and how they compromised. Chapter 9 comments on the less obvious agendas of several participants. Special attention is given to the role of the Office of Management and Budget (OMB), since

their position on the use of regulatory negotiation is critical to reg-neg's future as a viable alternative to traditional adversarial or adjudicatory rulemaking procedures. The role of the Wood Heat Alliance (WHA) as an appropriate representative of the woodstove industry is examined in chapter 10 with an analysis of interviews with stove manufacturers. Finally, chapter 11 presents conclusions on the negotiations and comments on negotiated rulemaking in general.

In the course of this investigation I have attended all but the first two negotiation meetings to observe the dynamics of the interchange. I have also interviewed twenty woodstove manufacturers - primarily from the Southeast - as well as members of the reg-neg committee and others who have become involved. I will attempt to show that the issues involved in the RWC emission problem logically require that many interests be represented - that it is perhaps a perfect candidate for a negotiated requlation if the criterion for success is reaching an agreed-upon standard. Other criteria exist, however, and in the long run court challenges and/or public opinion may present opposing evidence.

Tables and figures will follow the page in which they are first referred. The appendices follow the bibliography. Appendix I is a draft of the NSPS final reg-neg agreements. This may be amended before official EPA publication in the Federal Register.

CHAPTER I

EMISSIONS FROM WOOD HEAT DEVICES: "DOESN'T IT BOTHER ANYBODY THAT IT'S PART OF OUR AMERICAN HERITAGE TO SIT DOWN IN FRONT OF A CRACKLING FIRE?"[3]

The precipitous increase in foreign oil prices of the early 1970s resulted in many changes in energy use patterns in the United States. One striking change in many areas was a rapid increase in the use of residential wood combustion (RWC) for home heating. Although RWC had been a primary source for some rural and/or lower income sectors, and had been gradually declining in this century, the 1970s witnessed an increase in RWC use across almost all demographic groups.

WOODSTOVE USAGE

It is estimated that 7 to 8 million new wood stoves were sold between 1974 and 1984. In Vermont, a 1981 survey indicated that wood was used as the primary source of heat in more single family households than was electricity, natural gas, kerosene, coal, and wood and was secondary only to oil (Peterson 1984, Loh 1984, Roper 1984). Lipfert (1983)

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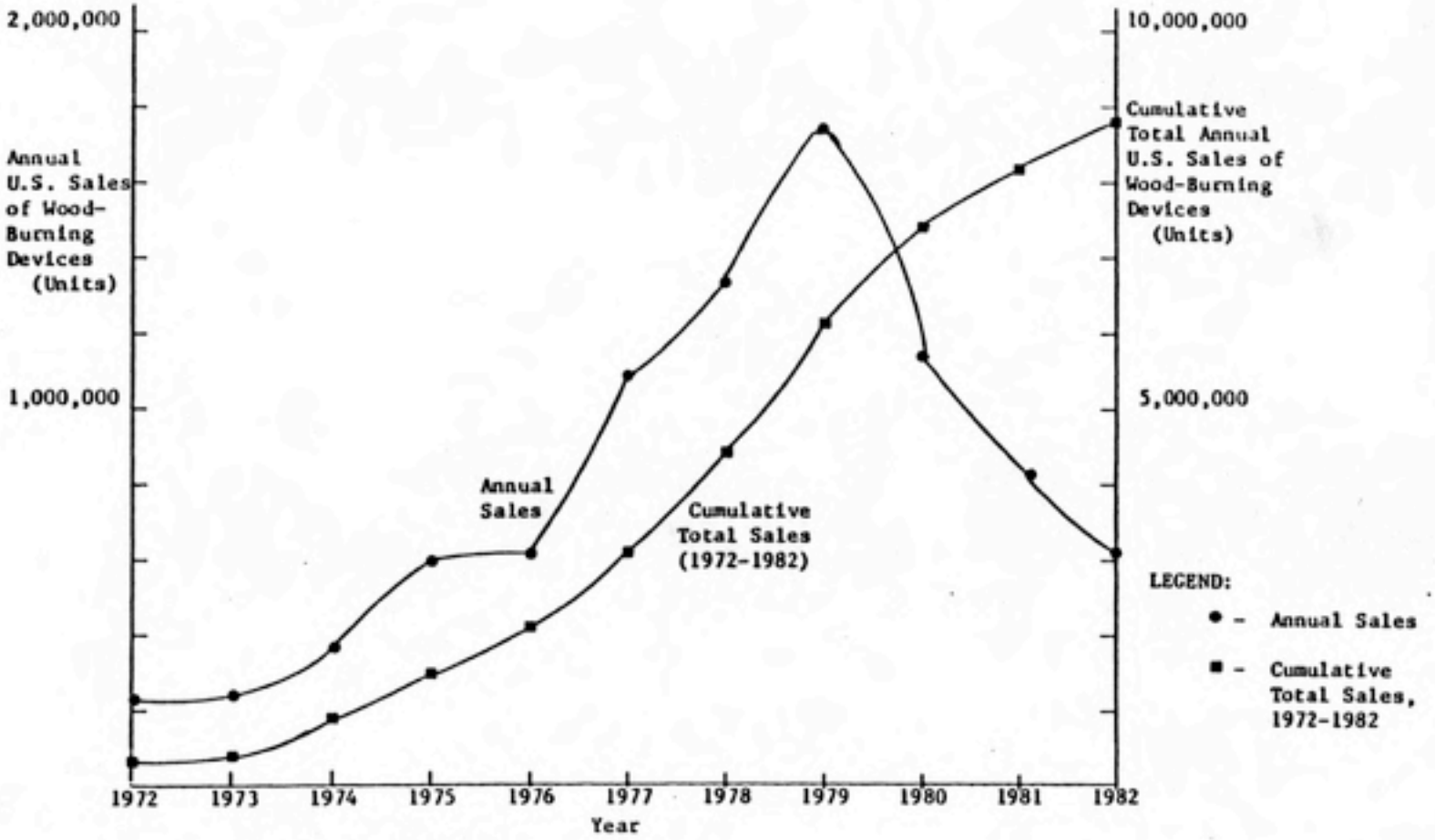
[3]Medora Lile, President, Woodburners United of Missoula County, one of the first localities to recognize a RWC emission problem. (New York Times, November 6, 1983.)

estimated that 9-11% of United States space heating was from wood-fired heaters in the 1978-79 season. Weintraub estimated that in the 1980-81 season 20% of Americans heated at least partially with wood, while a more detailed Forest Service study indicated 28% for that period. These percentages are more significant when one considers that for a large number of households, wood heat is not possible. Figure 1 depicts this increasing trend in use and the early increase and subsequent decline in sales. Contacts with woodstove dealers indicate that the market has since stabilized, and all indications are that people will continue to heat with woodstoves. The open fireplace has also become more popular for a certain growing and young urban (as well as suburban and rural) professional population. Although fireplaces are not considered an economically viable heat source, more and more new households can afford the fireplace "charm." Table 1 shows that whereas fireplaces in most communities are negligible source of emissions, in certain areas (Denver, Fresno) where most RWC may be more "recreational," fireplaces can be significant contributors to RWC emissions.

Data on state-by-state RWC trends have been scarce and inconsistent in method. Figure 2 shows state-by- state usage as estimated by a U.S. Department of Energy report based on 1980 census data. [Due to a "dry wood assumption," early emissions estimates based on this census data are now



Source: U.S. Census (1972-82)

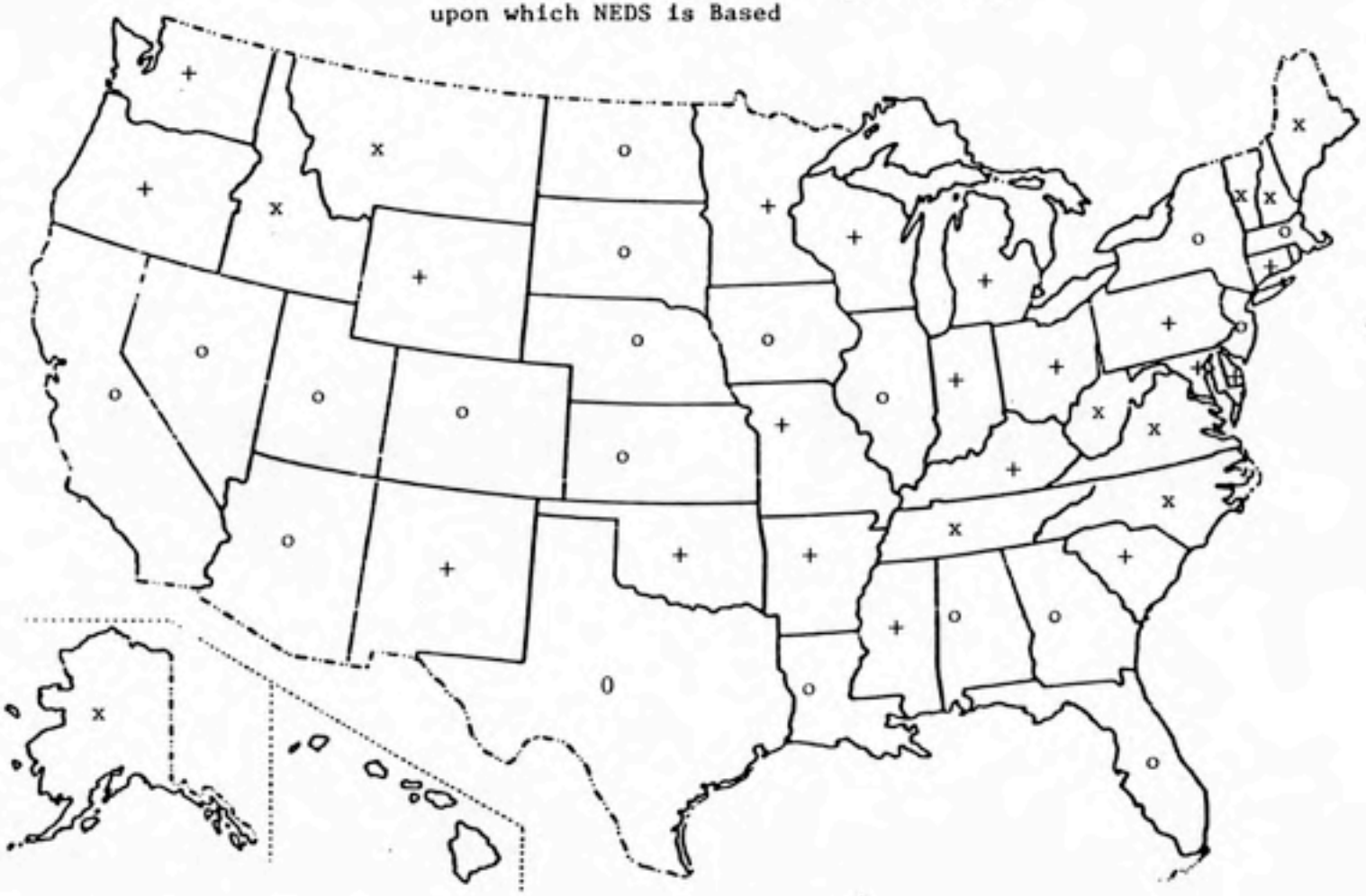
Figure 1. Annual and Cumulative U.S. Sales of Residential Wood-Burning Devices, 1972-82

Table 1

RWC EMISSIONS ESTIMATES NORMALIZED BY USING EPA's LATEST STOVE AND FIREPLACE EMISSION FACTORS

Locality, State	Date	Cord Wt kg/ cord	Total HHs 1000s	RWC TSP Emissions				RWC CO Emissions			
				Stoves 1000 T/Yr	Frplc 1000 T/Yr	Total 1000 T/Yr	Per lb/ HH/Yr	Stoves 1000 T/Yr	Frplc 1000 T/Yr	Totl 1000 T/Yr	Per lb/ HH/Yr
Waterbury, VT	1980/81	1497	0.647	.029	.002	.031	96	.179	.013	.192	594
Western MA	1983/84	955	281	.429	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nashville, TN	1981/82	1438	178	1.74	.47	2.21	25	10.76	2.87	13.63	154
Petersville, AL	1980/81	1438	1.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minneapolis, MN	1979/80	1815	721	8.48	1.76	10.25	28	52.5	10.7	63.2	175
Albuquerque, NM	1980	1100	151	1.565	.725	2.29	30	9.69	4.40	14.09	174
Missoula, MT	1982/83	1489	23	.465-.939	.064-.128	.529-1.07	46-93	2.88-5.81	.386-.779	3.27-6.59	284-573
Denver, CO	1983/84	1100	567	2.65	4.13	6.78	24	16.42	25.05	41.46	146
Telluride, CO	1983/84	1100	0.671	.023	.001	.024	71	.142	.006	.148	440
Reno, NV	1983/84	1011	62.6	.442	.307	.749	24	2.737	1.863	4.6	147
Las Vegas, NV	1983	1100	103	N/A	0.1	N/A	N/A	N/A	N/A	N/A	N/A
Fresno, CA	1981/82	1815	96	.036	1.17	1.20	25	.221	7.07	7.29	152
Boise, ID	1983/84	N/A	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Portland, OR	1983	1588	386	6.51	2.52	9.04	47	40.31	15.32	55.63	289
Medford, OR	1983	1588	42	1.58	.29	1.87	89	9.75	1.77	11.52	549
Eugene, OR	1981/82	1800	70	2.18	.68	2.87	82	13.50	4.16	17.66	505
Yakima, WN	1982/83	N/A	21.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Spokane, WN	1980/81	1588	70.9	.961	2.11	3.07	86	5.95	12.79	18.74	528
Anchorage, AK	1982/83	1444	55.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Figure 2. Statewide Average per Household Wood Usage, From U.S. Department of Energy Estimates upon which NEDS is Based



/o/ 0 - 0.5 Cords /+/ .5 - 1.0 Cords /x/ 1.0 - 2.0 Cords

felt to be as much as 25% low (Nero 1984).] A national wood usage telephone survey by the USDA Forest Service in 1980-1981 provided what may be the best available estimate of state-by-state total wood burned. Table 2 gives the results of the Forest Service study and Table 3 compares the two studies. Per household, usage was highest in the Pacific Northwest and in Northern New England. Data such as these are typical of most of those available in that they do not accurately point out local problems. For example, in 1983 the head of the Western Massachusetts Department of Environmental Quality Engineering David Howland identified wood burning as the greatest source of air pollution in Western Massachusetts (New York Times, December 8, 1983) although Massachusetts shows a relatively moderate .52 cords per household in the Forest Service study. Moreover, woodstove emission problems are not limited to the Northeast or the Northwest. Other areas such as the resort areas of the Rocky Mountains have concentrations of RWC use. Perhaps surprisingly, the Southeast contains 39% of the wood heating devices and accounts for 32% of the wood burned (DeAngeles et al., 1980). Approximately 16% of North Carolina households used wood as their main home heating fuel in 1981 and 47% burn at least some wood, for a total of at least 3.4 million cords per heating season (Kamens 1984). A detailed and consistent nationwide information base on RWC usage is not available at this time.

Table 2

FUELWOOD CONSUMPTION CHARACTERISTICS BY STATE, 1980-81

State	Households burning any amount				Households burning 1/3 cord or more			Average burned over all households
	Number hshld	% brng	Average burned	Total burned	% brng	Average burned	Total burned	
	Millions		Cords	Million Cords		Cords	Million Cords	Cords
Alabama	1.324	28	2.01	0.76	27	2.11	0.75	0.56
Arizona	.963	24	.98	--	11	1.97	--	--
Arkansas	.821	42	2.46	.85	42	2.46	.85	1.03
California	8.633	28	.76	1.84	14	1.39	1.63	.21
Colorado	1.059	35	1.05	.39	24	1.44	.37	.37
Connecticut	1.094	30	1.34	.44	22	1.78	.42	.40
Delaware	.207	29	--	--	--	1.45	--	--
Washington, DC	.253	--	--	--	--	--	--	--
Florida	3.743	11	1.48	.62	10	1.58	.61	.17
Georgia	1.872	28	1.40	.73	21	1.78	.71	.39
Idaho	.323	.46	2.62	.39	38	3.15	.39	1.21
Illinois	4.051	22	1.79	1.58	16	2.38	1.56	.39
Indiana	1.936	23	1.90	.86	21	2.08	.85	.44
Iowa	1.056	21	1.93	--	17	2.26	.41	--
Kansas	.870	21	1.89	--	18	2.15	--	--
Kentucky	1.264	26	2.50	--	23	2.82	.81	--
Louisiana	1.421	13	1.83	--	9	2.63	--	--
Maine	.397	54	3.92	.84	49	4.34	.84	2.13
Maryland	1.466	21	1.56	.49	20	1.68	.48	.33
Massachusetts	2.027	29	1.81	1.07	23	2.25	1.05	.52
Michigan	3.193	25	2.21	1.79	23	2.42	1.78	.56
Minnesota	1.442	35	1.92	.96	23	2.79	.93	.67
Mississippi	.830	27	--	--	25	--	--	--
Missouri	1.792	36	1.92	1.23	27	2.52	1.21	.69
Montana	.286	38	2.44	.26	31	2.94	.26	.91
Nebraska	.572	14	--	--	--	--	--	--
Nevada	.305	--	2.24	--	--	2.24	--	--

Table 2
(continued)

FUELWOOD CONSUMPTION CHARACTERISTICS BY STATE, 1980-81

State	Households burning any amount				Households burning 1/3 cord or more			Average burned over all households
	Number hshld	% brng	Average burned	Total burned	% brng	Average burned	Total burned	
	Millions		Cords	Million Cords		Cords	Million Cords	Cords
New Hampshire	0.324	47	3.00	0.46	44	3.10	046	1.42
New Jersey	2.551	18	.89	.41	15	1.01	.40	.16
New Mexico	.444	43	1.18	.23	33	1.46	--	.51
New York	6.332	18	1.86	2.12	14	2.30	2.06	.33
North Carolina	2.047	46	2.05	1.92	40	2.31	1.90	.94
North Dakota	.229	36	1.70	.14	36	1.70	.14	.61
Ohio	3.837	30	1.84	2.09	26	2.07	2.07	.54
Oklahoma	1.114	22	--	.57	19	2.67	.57	.51
Oregon	.993	58	2.68	1.55	54	2.87	1.54	1.56
Pennsylvania	4.213	23	2.25	2.20	19	2.69	2.17	.52
Rhode Island	.339	25	--	--	21	--	--	--
South Carolina	1.031	36	1.63	.61	30	1.94	.60	.59
South Dakota	.244	27	3.32	.22	23	3.93	--	.90
Tennessee	1.615	38	2.40	1.47	36	2.50	1.46	.91
Texas	4.945	25	1.08	1.32	20	1.27	1.28	.27
Utah	.448	32	2.03	--	24	2.65	--	--
Vermont	.178	58	3.95	.41	52	4.38	.40	2.28
Virginia	1.857	46	2.06	1.76	42	2.25	1.74	.94
Washington	1.540	53	2.04	1.67	43	2.51	1.65	1.09
West Virginia	.687	35	2.67	.64	33	2.82	.64	.94
Wisonsin	1.653	28	2.72	1.28	25	3.04	1.27	.77
Wyoming	.166	40	2.19	.14	31	2.72	.14	.87

Table 3

STATEWIDE RWC WOOD USE ESTIMATES FROM U.S. DOE AND THE USDA FOREST SERVICE (CORDS/YEAR; 1980-81)

State	U.S. Department of Energy			USDA Forest Service	
	Dry Tons	Million Cords	Cords Per HH	Million Cords	Cords Per HH
Alabama	0.712	0.59	0.45	0.76	0.56
Arizona	0.189	0.156	1.19	-	-
Arkansas	0.272	0.225	0.28	-	-
California	0.566	0.47	0.57	0.85	1.03
Colorado	0.569	0.47	0.44	0.39	0.37
Connecticut	0.792	0.65	0.59	0.44	0.40
Delaware	0.168	0.139	0.67	-	-
Washington, DC	0.015	0.012	0.05	-	-
Florida	0.795	0.66	0.18	0.62	0.17
Georgia	0.991	0.82	0.44	0.73	0.39
Idaho	0.399	0.33	1.02	0.39	1.21
Illinois	1.830	1.51	0.37	1.58	0.39
Indiana	1.615	1.33	0.69	0.86	0.44
Iowa	0.171	0.141	0.13	-	-
Kansas	0.154	0.127	0.15	-	-
Kentucky	1.473	1.216	0.96	-	-
Louisiana	0.382	0.315	0.22	-	-
Maine	0.762	0.63	1.59	0.84	2.13
Maryland	1.090	0.90	0.61	0.49	0.33
Massachusetts	1.085	0.90	0.44	1.07	0.52
Michigan	2.191	1.81	0.57	1.79	0.56
Minnesota	1.447	1.19	0.83	0.96	0.67
Mississippi	0.625	0.516	0.62	-	-
Missouri	1.777	1.47	0.82	1.23	0.69
Montana	0.401	0.33	1.15	0.26	0.91
Nebraska	0.091	0.075	0.13	-	-
Nevada	0.125	0.103	0.34	-	-
New Hampshire	0.430	0.36	1.11	0.46	1.42
New Jersey	1.112	0.92	0.36	0.41	0.16
New Mexico	0.473	0.39	0.88	0.23	0.51
New York	2.693	2.22	0.35	2.12	0.33
North Carolina	2.819	2.33	1.14	1.92	0.94
North Dakota	0.034	0.03	0.13	0.14	0.61
Ohio	2.536	2.09	0.54	2.09	0.54
Oklahoma	0.874	0.72	0.65	0.57	0.51
Oregon	0.947	0.78	0.79	1.55	1.56
Pennsylvania	3.054	2.52	0.60	2.20	0.52
Rhode Island	0.141	0.116	0.34	-	-
South Carolina	0.626	0.52	0.50	0.61	0.59
South Dakota	0.059	0.05	0.20	0.22	0.90
Tennessee	2.089	1.72	1.065	1.47	0.91
Texas	0.582	0.48	0.097	1.32	0.27
Utah	0.237	0.196	0.44	-	-
Vermont	0.347	0.29	1.63	0.41	2.28
Virginia	2.298	1.90	1.02	1.76	0.94
Washington	1.088	0.90	0.58	1.67	1.09
West Virginia	0.958	0.79	1.15	0.64	0.94
Wisonsin	1.590	1.25	0.76	1.28	0.77
Wyoming	0.149	0.12	0.72	0.14	0.87
Totals		39.818	0.50	36.31	0.51

EMISSION CONCERNS

Regardless of the inconsistencies in RWC use data, new stove sales figures attested to a significant nationwide use increase. It can also be assumed that there had been a similar increase in the use of existing stoves as well. Concurrently, there developed growing concern with potential health risks associated with RWC. These concerns focused basically in three areas: ambient air quality standards, health risks, and indoor air pollution.

Ambient Air Quality Standards

Several communities noted that RWC emissions were a significant factor in meeting U.S. EPA's national ambient air quality standards (NAAQS). In some areas, increased RWC usage was even found to negate gains made in cleaning up industrial point sources. Figure 3 shows such emission trends in Oregon. In Missoula, Montana, which is currently a non-attainment area for both carbon monoxide (CO) and particulate matter (PM), RWC contributed to 60-70% of winter PM and 35-50% of winter CO (Weigold 1984 and Table 4).

Since adverse health effects are implicit in NAAQS non-attainment there were also concerns with health. In 1980 a four-year study concluded that Missoula, Montana's children's lungs had lower capacities than the average of other Montana children (Table 5 shows a summary of this study.) One-half of the 22,000 homes in the Missoula Valley heated with wood, and the town "nearly dissappeared under a

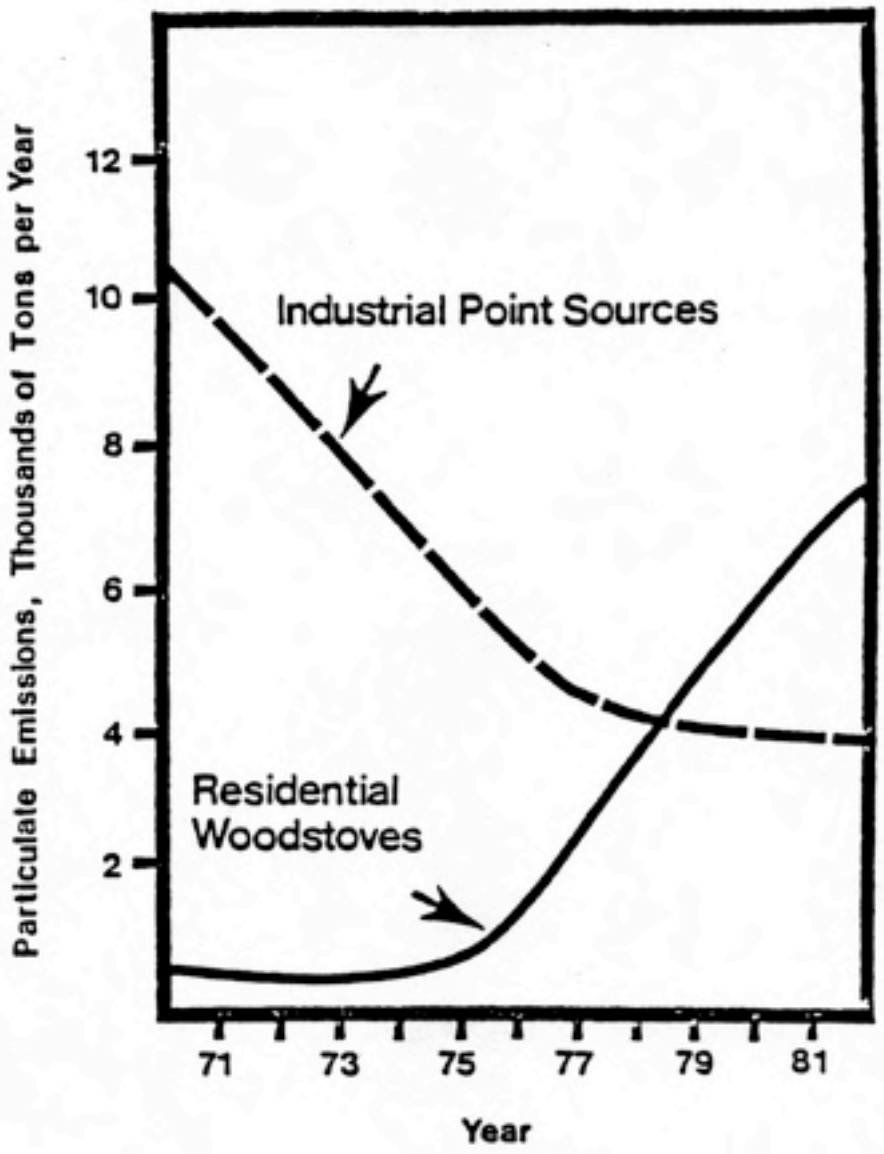


Figure 3. Industrial and Residential Particulate Emissions Portland, Oregon

Table 4

EMISSION INVENTORY FOR WINTER SEASON,[c]

MISSOULA, MONTANA

Emission Source Category	Seasonal Emissions (tons) Particulates		Carbon Monoxide	
	1979/80[a]	1982/83[b]	1979/80[a]	1982/83[b]
Residential Wood Combustion[c]	600	1,315	5,340	6,362
Paved Roads	204	204	-	-
Point Sources	150	150	194	194
Fuel Consumptiin	149	149	49	49
Transportation	73	73	7,928	7,928
Unpaved Roads	56	56	-	-
Total Emissions	1,234	1,947	13,511	14,533
RWC % Contribution	48.7	68	39.5	43.8

a) Church, 1980

b) Steffel, 1983. All 1979/80 emissions except RWC were assumed to remain constant.

c) Assumes all RWC emissions occur within a 120-day winter season.

Table 5

SUMMARY OF DATA FROM MISSOULA, MONTANA STUDY

Test Group	Study Period	Ambient TSP[a]	Observations
475 urban Missoula students. 133 Missoula students from outlying areas.	Jan-Feb 1978	In outlying areas, levels were 1/3 to 1/2 the levels of urban Missoula	Except for FEB_1,[b] PFT tests were poorer in urban students than students from outlying areas
328 Great Falls students	May 1978	Annual avg. for Missoula: 81 ug/m^3 Annual avg for Great Falls: 42 ug/m^3	Except for FEV_1, PFT tests were poorer in Missoula students than those of Great Falls
366 Missoula students (Missoula Acute Effects Study)	1978-1979	Three-day avg. TSP range: 0-200 ug/m^3. Only 3 test days had TSP below 50 ug/m^3 none were above 200 ug/m^3	Best PFT at 0-100 ug/m^3 TSP Worst PFT at 151-200 ug/m^3 TSP
120 Missoula students (Missoula Acute Effects Study)	1979-1980	Three-day avg TSP: 440 ug/m^3 Control days-avg TSP: 93-154 ug/m^3	PFT are low on high TSP days
84 Missoula adults with chronic obstruc-pulmonary disease	1978-1979	Winter TSP avg. 121 ug/m^3 Summer TSP avg. 81 ug/m^3	All PFT parameters and activity levels decreased as TSP increased

Sources: Carlson, J. in 1980 International Conference on Residential Solid Fuels, Portland Oregon.

Montana Air Quality Bureau 1980.

[a] TSP: Total Suspended Particulates

[b] FEV_1: (Forced Expiratory Volume) The volume of air expired in the first second.

[c] PFT: (Pulmonary Function Tests) Measurements of lung function.

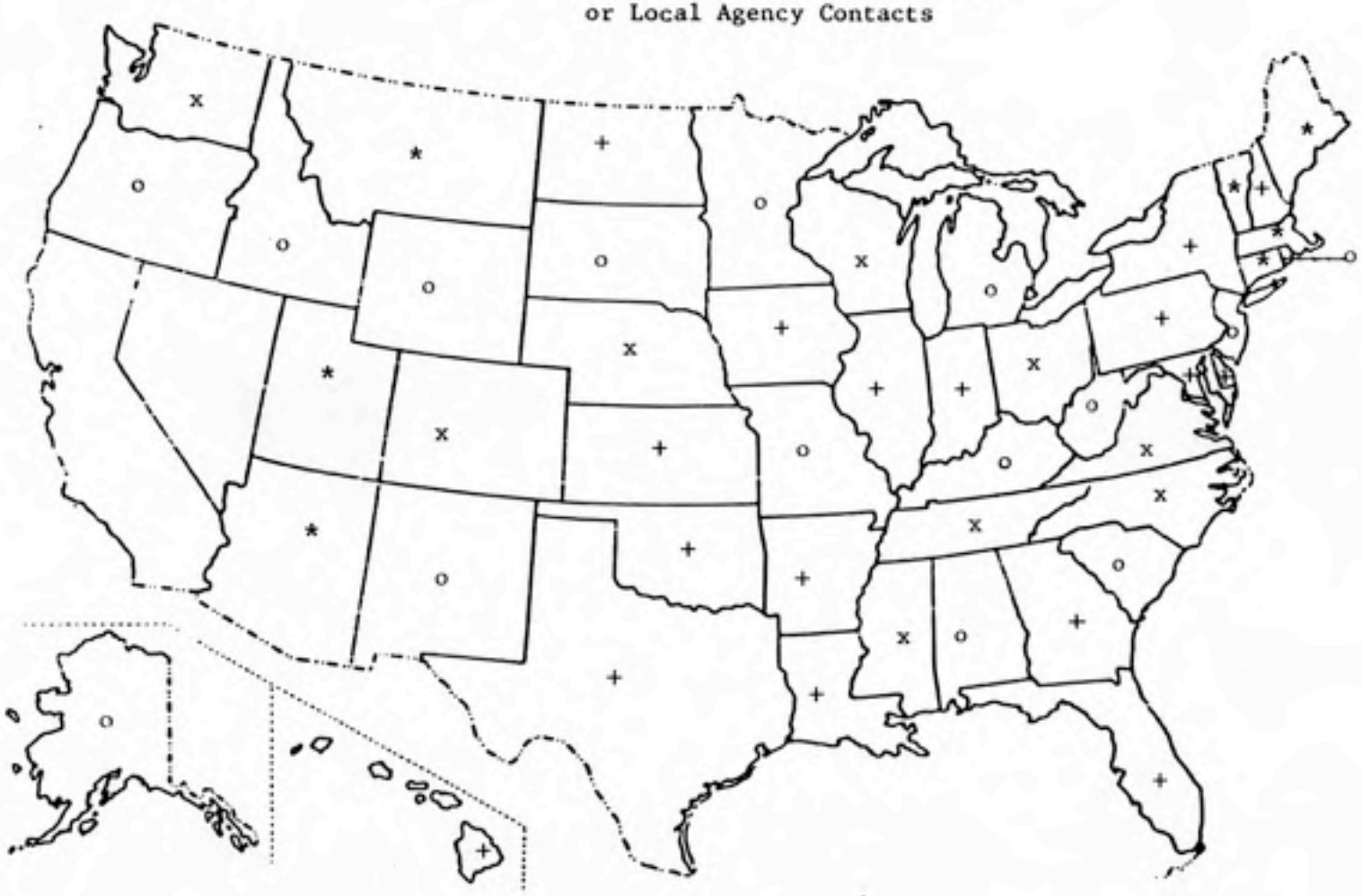
blanket of wood smoke" during the frequent thermal inversion conditions (Loh 1984). This is illustrated in the picture on page ii.

Other areas have had air quality problems associated with RWC as well. In 1983, Joseph Grimsley, N.C. Secretary of Natural Resources and Community Development, reported that wood emissions could have an impact on some N.C. cities: Raleigh, Durham and Charlotte were all having difficulty in meeting carbon monoxide standards (Spohn 1983). Studies in Nashville showed that residential wood combustion was a significant contributor to particulate levels and were "cause for concern as to whether particulate ambient air quality standards could be achieved" (Imhoff et al. 1984). Since only 11% of the homes were estimated to heat with wood in Nashville, potential existed for further use. RWC has been specifically identified as a major cause of PM non-attainment in Medford, Oregon and to CO non-attainment in Albuquerque, N.M. and Reno, Nevada. Figures 4 and 5 show the national distribution of locally perceived RWC emission problems. The nature of these perceived problems is not given. Often the most obvious problem is visibility, due to the efficient light scattering effect of RWC emissions small particle size. A recent study showed that 50% of Albuquerque's winter visibility impairment was caused by wood smoke (Weigold 1984).

RWC is not considered to be a significant contributor to other priority pollutants currently regulated by NAAQS.

Figure 4 Areas Identified by State and Local Agency Contacts as Having Known or Suspected RWC Impacts

Figure 5. Frequency of Occurence of RWC Impacts as Perceived by State or Local Agency Contacts



/+/ 0 - 3 Days

/o/ 4 - 25 Days

/*/ 25 Days

/x/ Don't Know or No Answer

Hydrocarbons (HC) are basically products of incomplete combustion, a characteristic of most residential stove operation, and may possibly be of some local concern. (HC is not a criteria pollutant but is regulated as a precursor of ozone.) Oxides of nitrogen (NO_x) are basically products of high temperature combustion: not a characteristic of RWC use.

Health Risks

A contribution to NAAQS non-attainment of course implies a health risk commensurate with the basic assumptions of the Clean Air Act (CAA). Beyond this, however, RWC emissions are particularly respirable (80% are smaller than 2.5 micrograms (um)), and are thereby a greater health hazard than NAAQS-total suspended particulates (TSP) compliance implies. In addition, much of the polycyclic organic matter (POM) in wood smoke has been found to be mutagenic and thereby a possible human cancer risk. Studies in London 200 years ago related a high incidence of scrotum cancer among chimney sweeps to the soot from smoke, and coal tar has induced cancer in animal studies (Harvey 1982). More recent studies show that at least one wood smoke component, benzo(a)pyrene (BaP) is a very potent animal carcinogen. A 1984 EPA study reported that in New Jersey, 61% of these carcinogenic particles in the air were generated through combustion processes and not major point sources. The study concluded that these air pollutants may

be a greater health threat than previously thought. (New York Times, August 1984). In fact, Harkov (1985) reports that RWC accounts for 98% of New Jersey's winter ambient BaP. Figure 6 and Table 6 show the seasonal variations and source apportionment.

Studies by Kamens et al. (1985) have shown that while the mutagenic nature of wood smoke degrades in the presence of sunlight, nitrogen dioxide plus ozone greatly increase the mutagenicity. Moreover, the mutagenicity degradation is slowed by low temperatures. POM mutagenicity is therefore highly variable and would be of greater concern in some colder urban areas with high RWC use.

Other known carcinogens may also be problematic. Liparl (1984) found that RWC is likely to be a major source of primary aldehydes in the winter and that formaldehyde constituted 21-42% of the wood smoke aldehyde component.

For particulates that are not mutagenic, little is known of toxicity. Dartmouth Professor James Hornig reported that wood smoke could especially pose a problem for children with asthma and elderly people with chronic lung problems (New York Times, December 8, 1983), but there is little evidence of bioaccumulation or adverse effects in plants, microorganisms or fish and other wildlife (Santodonato et al. 1979).

Indoor Air Pollution

The health risks associated with the above components of wood smoke take on an added dimension in this third area

Table 6

ESTIMATED ANNUAL HEATING SEASON (NOV.-MAR.)

AND NON-HEATING SEASON BaP EMISSION RATES FOR NEW JERSEY

Fuel	User	BaP Est rate (ng/Btu)	Annual (kg)	Heating Season (kg)	Non-htg Season (kg)
Solid fuels					
Coal	Utilities	6.1×10^{-2}	4.5	1.9	2.6
Coal	Residential	37.7	3.8	3.8	
Wood	Residential	227	6129	6129	
Total			6137	6135	2.6
Oil					
Heating	Residential	2.6×10^{-3}	0.4	0.4	
Mis. distillate	Commercial/ industrial	2×10^{-4}	0.2	0.1	0.1
Residual	Utility/ commercial/ industrial	4.3×10^{-4}	<0.1		
Total			0.6	0.5	0.1
Natural gas					
Heating	Residential	2.0×10^{-4}	0.1	0.1	
Motor fuels					
Gasoline	Autos/trucks	0.6	228	95	133
Diesel	Trucks/buses	2.3	85	35	50
Total			313	130	183
Grand Total			6451	6266	186

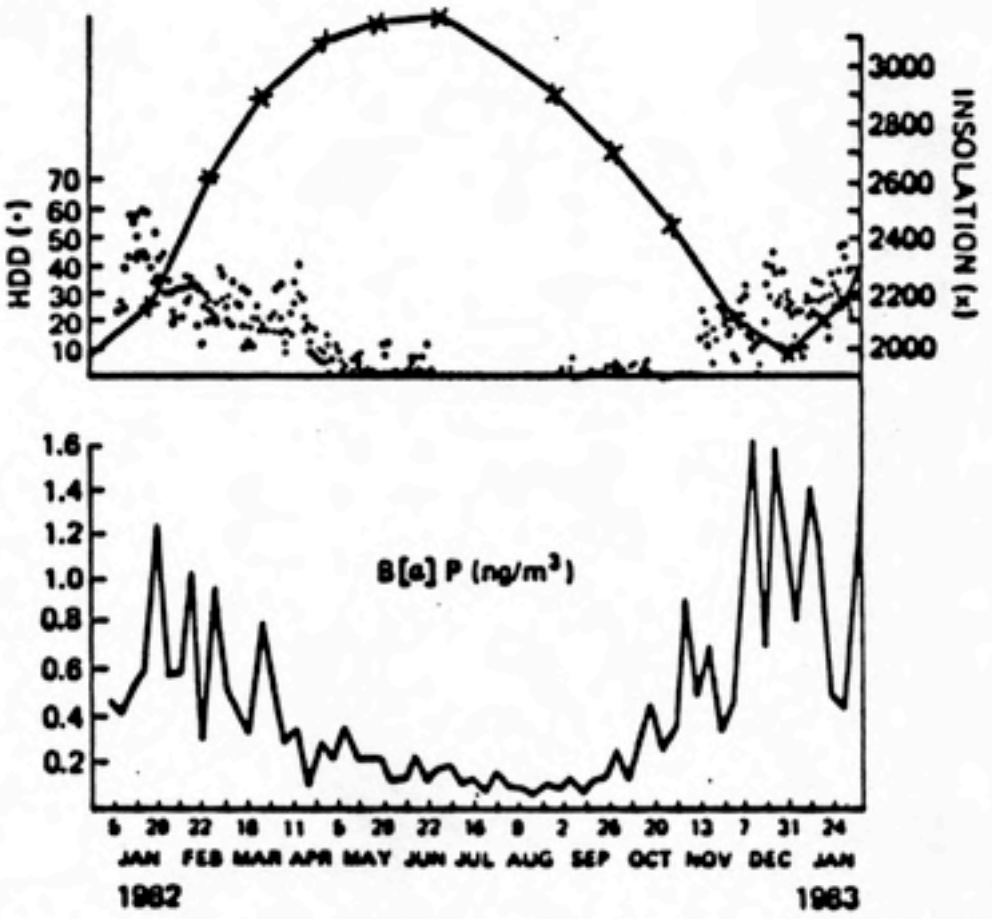


Figure 6. Top: Plot of heating degree days (HDD) as well as insolation during the period from January 1982 through January 1983. HDD data from NOAA and insolation data from Anderson.[38] Bottom: Plot of average B(*a*)P concentrations (ng/m³) for all 27 New Jersey sites from January, 1982 through January, 1983.

of concern. The use of fireplaces or woodstoves has been shown to increase indoor concentrations of particulate matter from 20 to 60 times that of natural gas heat (Cooper 1982). Although indoor fugitive emissions are highly dependent on variations in user operation and installation, and can vary widely from household to household, use of better insulation and building sealing heightened indoor concentrations of any pollutant with an inside source.

There have been few studies identifying RWC as an indoor health problem. Early studies by Kirk Smith and others in Thailand and Nepal established a dose response relationship between indoor wood cooking and respiratory disease (DeKoming 1984). However, these were very high concentrations not likely found in typical USA RWC use. Also the open fires common to the study have emission characteristics quite different from modern reduced air stoves: POM formation is reduced and particulate size tends to be larger in an open fire (personal communication from Judy Mumford, U.S. EPA). This may account for a lack of any association found with cancer in these studies.[4]

A more recent study in Michigan found a significant increase in symptoms of severe respiratory illness in children aged 1 to 7 from homes with RWC compared to matched

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[4]Holly Reid, a field worker in the Nepal study suggests that a very low life expectancy from causes other than cancer could be responsible. Studies on open coal burning stoves in China do show a lung cancer association (personal communication from Judy Mumford, U.S. EPA 1986).

children in homes without RWC. A significant increase in mild or moderate symptoms was not indicated (Honicky 1985). Actual air monitoring was not done and it is conceivable that the relation could have resulted from the temperature variations common to wood heat or humidity differences. Nonetheless, a RWC risk is indicated.

AFFECTED GROUPS

Information has already been presented concerning the geographic distribution of RWC use (see Figure 2 and Table 2). The regional nature of RWC emissions has been established although the specific contribution of RWC is not generally known for all high impact areas. It is nonetheless clear that these areas stand to benefit from any decrease in RWC emissions from both health concerns as well as from perhaps less costly industrial development in non-attainment areas.[5] The question remains, who stands to pay for reduction in RWC emissions? Ultimately the user as well as the RWC industry.

Table 7 shows the demographic distribution of RWC users. Although the table does not account for the amount of wood used, several interesting associations appear.

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[5] In accordance with EPA's "offset" policy, emissions from new sources in non-attainment areas must be offset by reductions in existing sources. This greatly increases the expense of certain industrial expansion. Additionally, non-attainment areas' new sources must meet stricter Best Achievable Control Technology (BACT) standards than the NSPSs in attainment areas.

Table 7.

Percent Of Households Using Different Wood-Burning Equipment By Demographic Group, 1980-81

Demographic Group	Fireplace			Stove			Furnace	Any Equipment	Households in Category (Millions)
	Ordinary	With Insert	Total	Not Airtight	Airtight	Total			
Total	14	7	20	2	7	8	1	28	80.0
Regions									
West	20	8	28	1	6	8	(2)	34	15.1
North Central	13	6	19	1	7	8	1	26	22.2
Northeast	11	5	17	2	7	9	2	24	20.0
South	14	7	20	2	7	9	1	29	22.6
Location									
Urban	14	5	19	1	4	5	1	23	62.9
Rural	14	12	26	4	18	22	3	45	17.0
1980 Income									
$0 to 10,000	4	2	6	2	4	6	1	12	20.9
$10,001 to 20,000	9	5	14	1	7	8	1	21	22.8
$20,001 to 30,000	17	8	25	1	9	10	1	33	17.0
$30,001 to 40,000	23	11	34	2	8	10	1	42	9.3
$40,000 +	33	13	46	1	9	10	1	53	9.9
Education									
8 years or less	4	3	7	2	7	10	1	17	7.7
9 to 11 years	6	3	9	(2)	9	9	1	18	6.9
12 years	11	6	17	2	8	10	1	26	26.9
College, 1 to 3 years	15	7	21	2	5	7	1	27	15.2
College, 4 + years	22	9	32	1	6	7	1	36	23.3
Age of head									
0 to 24 years	7	3	10	(2)	2	2	(2)	7	5.2
25 to 29 years	11	7	18	1	6	7	1	11	9.0
30 to 44 years	18	9	27	2	9	12	1	31	24.7
45 to 64 years	16	7	23	2	6	9	1	30	24.2
65 + years	7	3	10	1	4	5	1	18	18.0
Not determined	12	5	17	2	5	7	1	3	3.1
Conventional fuel used									
Natural Gas	16	4	20	1	3	3	(2)	24	42.2
Fuel Oil	13	8	21	2	10	12	1	30	13.5
Electricity	13	10	22	2	9	12	1	32	17.0
Other	8	9	14	4	11	15	2	26	5.7
None	13	13	25	9	49	58	13	68	1.6

[1]Figures are percent of households in the demographic category that use the given equipment.
[2]Less than 0.5 percent.
[3]Totals do not always add up because of rounding.

Considering that most "fireplaces with inserts" are probably equivalent to airtight stoves, airtight stove ownership increases only slightly with income while ordinary fireplace ownership increases significantly with income. A larger percentage of rural homes burn wood although the total number of urban households with RWC is almost twice that of total rural RWC homes. More detailed information - including wood usage, correlation with conventional fuel used, and urban vs. suburban breakdown - would be necessary to better assess the demographic impact of any RWC emission control strategy. Several state and local control programs have been initiated already, and analyses from them could improve this data base. Table 8 shows a conceptual distribution of various strategy cost impacts. A discussion of existing strategies appears in the next chapter, and a discussion of the various strategy impacts will follow. Specific costs of various controls will also be discussed later.

Table 8

CONTROL ELEMENT	PARTY INCURRING COST
Public Education	State government for planning, implementation and maintenance
Control Devices	Consumer
Energy Subsidies	Cost usually shared between consumer and state government
Episode Curtailment	State and/or local government for planning, operation, enforcement, and maintenance
Certification	State or Federal government to accredit test laboratories, reviewing test results, enforcement. Industry incurs the cost of performing the tests. Industry might pass the costs of these tests on the consumer.

CHAPTER II

EXISTING RWC EMISSION ABATEMENT PROGRAMS

Compared to other air pollutants, residential wood combustion (RWC) emission is a newly recognized problem. Laws do exist, however, and public officials at many levels have already investigated proposals for control regulations. Government action pertaining to woodstove emissions can be divided into three categories; 1) Federal, 2) State, and 3) Local.

FEDERAL

Federal authority to regulate RWC is provided in the Clean Air Act (CAA), which as previously administered provides only minimal protection from RWC emissions. Particularly applicable are sections 108 and 109, which describe national ambient air quality standards (NAAQS) for carbon monoxide (CO) and particulate matter (PM) (see Table 9).

CO is presently monitored under the air quality monitoring system and regulated as a criteria pollutant (for which NAAQSs are set) although no federal action had yet been directed specifically at wood smoke. Where wood smoke is a significant contributor to non-attainment areas with respect to CO, it thus could conceivably be regulated under

Table 9

NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Primary Standard
Particulate Matter	Annual (Geometric Mean)	75 ug/m^3
	24-hour*	260 ug/m^3
Sulfur oxides	Annual (Arithmetic Mean)	80 ug/m^3 (.03 ppm)
	24-hour*	365 ug/m^3 (.14 ppm)
CO	8-hour*	10 mg/m^3 (9 ppm)
	1-hour*	40 mg/m^3 (35 ppm)
NO_2	Annual (Arithmetic Mean	100 ug/m^3 (.05 ppm)
Photochemical oxidants	1-hour*	160 ug/m^3 (.08 ppm)
Hydrocarbons (non-methane)	3-hour*	160 ug/m^3 (.24 ppm)
Lead	Quarterly	1.5 ug/m^3

*Not to be exceeded more than once per year.

state implementation plans (SIPs) authorized by EPA. In fact, according to EPA's National Air Pollution Estimates (February 1984), RWC accounted for 8% of the total national CO emissions, more than a fourfold increase since 1973. RWC control could in fact relieve the burden on industry's new source development requirements in non-attainment areas, which could be of significant economic benefit. Industry was in fact generally supportive of Oregon woodstove regulations, as will be discussed later.

Existing NAAQSs for particulate matter under the CAA can also apply to RWC emissions. Again, however, these have not been specifically directed at wood smoke. EPA's 1984 national estimate for RWC particulate contribution was 12%. Wood smoke thus contributes a significant proportion of ambient air PM in specific air sheds and could be regulated under the existing standards. New particulate standards expected to be promulgated soon will be especially applicable to RWC emissions (Federal Register, March 20, 1984 pp. 10400-10436). Whereas the current standards limit the concentration of all particulates in the ambient air (i.e. total suspended particulates (TSP), typically less than 25 to 45 um) the proposed standards will be directed only at particulate matter smaller than ten microns in diameter (PM10) (Wood 'n' Energy December, 1984 p. 9). Table 10 compares the old and new standards. The new standard is intended to reflect more accurately the impact

Table 10

PROPOSED CAA PARTICULATE STANDARDS

TSP
Existing (all particulates)

	Annual	24-hour
Primary	75 ug/m^3 geometric mean	260 ug/m^3 not to be exceeded more than once per year
Secondary	-	150 u/m^3 not more than once per year

Proposed (PM10 only)

	Annual	24-hour
Primary	50-65 ug/m^3 expected annual arithmetic mean	150-250 ug/m^3 with one statistically expected exceedence per year
Secondary	-	70-90 ug/m^3 expected annual arithmetic mean

Note: EPA does not intend to change how particulate matter is currently defined for purposes of the prevention of significant deterioration increments (PSD).

From Federal Register March 20, 1984 p. 10408.

on health, because it is only the smaller particles which can penetrate the inner lung passageway (Cooper 1982). Because almost all wood smoke emissions are in this inhalable size range (Cannon 1984), wood smoke will contribute to a significantly larger proportion of the total regulated particulates when the PM10 standards take effect. For example, in 1978 data, RWC contributed 12.2% of TSP but accounted for 31% of the total respirable particles. (Cooper 1982; see Table 11). Later studies in Oregon and Montana show an approximate twofold increase in RWC contribution to the PM10 standard versus the earlier standard (Core 1984).

To summarize, primary components of RWC emissions are already regulated under NAAQS although action has not yet been directed at woodstoves. RWC's contribution to proposed PM10 standards will be significantly more than the 12% reported nationally in 1984 under the old standards. In specific inversion and high RWC use areas, the RWC contribution will be greater still.

Other potentially hazardous components of RWC emissions are either not in significant quantities or are not presently listed as NAAQS criteria pollutants (see Tables 11 and 12). EPA has additional authority to regulate RWC emissions under CAA section 112 (42 USC sec. 7412(b)(1)(B)), which requires an "ample margin of safety" to protect against hazardous air pollutants (HAP) - which by definition

Table 11

MAJOR POLLUTANT EMISSIONS FROM RESIDENTIAL WOOD COMBUSTION COMPARED TO EMISSIONS FROM OTHER SOURCES IN THE PORTLAND-VANCOUVER AQMA (1978)

Pollutant	Tons Per Yr	Tons in January	Av Tons Per Day in Jan	High Tons Per Day in Jan
Carbon Monoxide				
Wood-burning stoves	87,000	17,000	560	2,250
Transportation	779,000	65,000	2,100	2,100
Volatile Hydrocarbons	1,080	216	7.0	28
NO_X as NO_2	270	54	1.7	7.0
SO_X as SO_2	108	22	.70	2.8
Aldehydes	600	119	3.8	15
Polycyclic Organic Matter	160	32	1.0	4.1
Benzo(a)pyrene	1.4	.28	.009	.036
Carcinogens	21	4.2	0.14	.54
Priority Pollutants	220	44	1.4	5.7
Total Particulates	4,600	920	30	120
Respirable Particulates from other Portland sources	10,200	850	27	27
Total Particulates from other Portland sources	33,000	2,749	89	89

Table 12

EMISSIONS OF MAJOR POLLUTANTS FROM RESIDENTIAL WOOD COMBUSTION SOURCES

Chemical Species	Wood-Burning Stoves g/kg wood	Wood-Burning Stoves lbs/10^6 BTU[e]	Wood-Burning Stoves % Particulates	Fireplaces g/kg wood	Fireplaces lbs/10^6 BTU[e]	Fireplaces % Particulates
Carbon Monoxide	160 (83-370)	22	---	22 (11-40)	3.0	
Volatile Hydrocarbons	2.0 (0.3-3.0)	.28	---	19 ---	2.6	---
NO_x as NO_2	0.5	.07	---	1.8	.25	---
SO_x as SO_2	0.2	.03	---	---	---	---
Aldehydes	1.1	.15	---	1.3	.18	---
Condensable Organics	4.9 (2.2-14)	.67	58	6.7 (5.4-9.1)	.92	74
Particulates	3.6 (0.6-8.1)	.50	42	2.4 (1.8-2.9)	.33	26
Total particulates	8.5 (1-24)	1.2	100	9.1 (7.2-12)	1.3	100
Polycyclic Organic Mat.	0.3	.04	3.5	0.03	.004	0.3
Benzo(a)Pyrene	0.0025	.0003	.03	0.00073	.001	0.008
Carcinogens	.038	.005	.45	.0059	.0008	0.06
Priority Pollutants	0.41	.06	4.8	0.063	.009	0.7
Na	.005	.0007	.06	.004	.0006	.04
Al	.004	.0006	.05	.002	.0003	.02
Si	.003	.0004	.04	.002	.0003	.02
S	.03	.004	.4	.004	.0006	.04
CL	.05	.007	.6	.05	.007	.6
K	.07	.01	.8	.05	.007	.5
Ca	.004	.0006	.05	.005	.0007	.05
Organic Carbon	4.2	.58	49	4.2	.58	46
Elemental Carbon	.7	.1	8	1.2	.16	13

are pollutants not covered by NAAQS under section 109.

Polycyclic organic material (POM) in wood smoke could be such a HAP due to the demonstrated cytotoxicity and mutagenicity of many of the RWC POM species. RWC's contribution to POM has been estimated from 30% (Kamens 1984) to 60% (EPA 1984). BaP levels in N.J. were found to be ten times higher in the heating season than in other seasons during 1983 (see Figure 6). In fact, in the drafting of the 1977 CAA, a summary of the provisions of the conference agreement indicated that Congress expected criteria to be issued for POM, and benzo(a)pyrenes were specifically considered (Bonine and McGarity 1984). Thus EPA has been very aware of the presence of BaP and its carcinogenic effects, but has been reluctant to "list" it as an identified air pollutant since its "primary and only unregulated source is RWCs."[6]

Due to the nonspecificity of POM in general and its many different sources (see Table 13), there are many legal and administrative difficulties with "listing" RWC emissions under section 112. However, CAA section 111(d) (42 U.S.C. sec. 7411(d)) allows EPA to set New Source Performance

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[6] New York Times, August 19 1984, 11:4:1 The 1970 CAA required EPA to publish a list of HAPs for which the agency intended to establish national emission standards. Once a pollutant is "listed," the administrator has 180 days to publish a proposed National Emission Standard for Hazardous Air Pollutants (NESHAP) and another 180 days to publish a final NESHAP unless he finds the substance is clearly not an HAP.

Table 13

ESTIMATES OF ANNUAL POM EMISSION BY SOURCE TYPE
ON A NATIONAL BASIS

Source type	Estimated annual POM emissions, metric tons	Percent of total POM emissions from all sources
Residential heating		
Wood-fired total	3,837	34.8
primary heating	1,383	
auxiliary heating	2,376	
fireplaces	78	
Coal-fired	102	0.9
Oil-fired	7.4	<0.1
Gas-fired	9.8	<0.1
Open burning sources		
Agricultural open burning	1,190	10.8
Prescribed burning	1,071	9.7
Forest wildfires	1,478	13.4
Coal refuse piles	28.5	0.3
Land clearing waste burning	171	1.6
Structural fires	86	0.8
Mobile sources		
Autos-gasoline	2,160.8	19.6
Autos-diesel	1.2	<0.1
Trucks-diesel	103.5	0.9
Coke production	632	5.7
Industrial boilers		
Coal	69.0	6.3
Oil	1.3	<0.1
Gas	2.1	<0.1
Wood/bark	1.2	<0.1
Begasse	0.3	<0.1
Incinerators		
Municipal	0.3	<0.1
Commercial	55.8	0.5
Utility boilers		
Coal	12.9	0.1
Oil	0.3	<0.1
Gas	0.3	<0.1

Table 13
(continued)

ESTIMATES OF ANNUAL POM EMISSION BY SOURCE TYPE
ON A NATIONAL BASIS

Source type	Estimated annual POM emissions, metric tons	Percent of total POM emissions from all sources
Carbon Black	3.1	<0.1
Charcoal manufacturing		
uncontrolled batch kilns	0.8	<0.1
continuous furnace production	0.7	<0.1
Asphalt production		
Saturators	0.2	<0.1
Air blowing	0.2	<0.1
Hot road mix	3.9	<0.1
Barium chemicals		
(Black ash rotary kiln)	0.3	<0.1
TOTAL	11,031	

Standards (NSPS) for pollutants that are neither criteria pollutants nor HAPs under section 112. Since 70-80% of POM components in wood smoke either are particulates or are adsorbed onto particulates, particulate control is considered a sufficient means to control RWC POM emissions if implemented specifically for woodstoves (personal communication from Harriet Ammonn, U.S. EPA, February 1985). Implementation of section 111(d) generally would require establishment of an NSPS as well as a Best Available Control Technology (BACT) for individual State Implementation Plan (SIP) use. This process however is complex and cumbersome. Experience has shown that "sections 111 and 112 are not amenable to regulating toxic air pollutants effectively" (Cannon 1986).

The costs to stove users of full implementation of CAA or of possible POM regulations would vary depending on how each state chooses to comply with NAAQSs. The cost effectiveness for control of particulates from woodstoves has been estimated to be about $275 per ton and about $86 per ton for total emissions including CO and others (Emison 1984). (These figures do not credit potential savings from cleaner stoves due to reduced chimney cleaning and damage from chimney fires.) Others estimate $350 per ton PM and compare this with $1,000 to $17,000 per ton PM for various industrial controls (Hough 1983).

Implications of EPA alternatives will be discussed in chapter 3. EPA has had the authority but did not

take the lead in RWC emission control. Because of delay in federal initiative, several states led the way in establishing emission controls.

STATE CONTROLS

Federal NAAQS are generally administered by the various state implementation plans (SIPs) as approved by EPA. Wood smoke's contribution to excessive CO and TSP in non-attainment areas prompted many states to propose legislation and initiate studies. Two states, Oregon and Colorado, have already enacted legislation to regulate RWC, and Washington has proposed legislation which has passed its House and was awaiting Senate action as of May 1986 (Wood 'n' Energy, May 1986). Several other states are presently studying RWC emissions. The Coalition of Northeastern Governors (CONEG) completed a study on RWC in 1985 with recommendations for legislative action (personal communication from Dave Wilson, CONEG, February 1985). The Massachusetts legislature has considered a bill authorizing its Environmental Study Committee to investigate recommendations for control legislation (personal communication from Mark Geres, Massachusetts Office of Energy Resources, February 1985); and in North Carolina, a bill was proposed to initiate a similar study (personal communication from Rep. Margaret Keesee-Forester, February 1985). Stove certification legislation was introduced in New York State by August 1986

(Wood 'n' Energy Aug. 1986). A geographical summary of current state action with a brief description appears in Figure 7 (updated through August, 1984). Note that the Southeast is significantly underrepresented although it accounts for 32% of all residential wood use.

A 1977-78 Portland (Oregon) Aerosol Characterization Study was the first receptor modeling/source apportionment study to use chemical mass balance (CMB) methods to demonstrate that RWC was a major contributor to particulate non-attainment. Subsequent Oregon SIP studies concluded that the woodstove industry must be forced to produce a cleaner stove (Gay 1986).

In 1983 Oregon passed the nation's first statewide woodstove legislation, to take effect voluntarily by July 1984 with required certification of new stoves by July 1986. The law required a 75% reduction in woodstove emissions by the year 2000, which would bring Oregon's non-compliance cities - Portland, Eugene, and Medford - within standards (Towslee 1984). Specifically, the law charged the Oregon Department of Environmental Quality (DEQ) to work with a Woodstove Advisory Committee to set a workable standard and to come up with test procedures by July 1984. Oregon's program included five major elements: 1) a testing procedure for stove emissions and efficiency; 2) TSP emissions standards; 3) an accreditation process for testing laboratories; 4) stove labeling requirements; and 5) certification procedures (Gay 1986). Testing of stoves was

State-by-State Emissions Update

Figure 7.

by Steven Maviglio

Alaska – Regulations are in place in the city of Juneau. Unique opacity standards require officials to see through the smoke.

California – Air Resources Board examining possible emissions control strategies and assisting towns in devising their own regulations. Truckee Meadows is the hardest hit area in the state.

Colorado – Statewide law goes into effect July 1, 1987. Voluntary program begins July 1, 1985. Requires all stoves, inserts, and fireplaces to be certified cleanburners. Towns allowed to have stricter laws. Department of Health plans testing to Oregon's standard this Fall to see if it should be adopted for the state.

Idaho – State air quality officials recently completed an assessment of wood smoke in Boise. Voluntary "no burn" days in some mountain towns.

Massachusetts – Department of Environmental Quality Engineering's western office chief says the state is "likely to follow" Oregon's stove certification program. Legislative approval may not be necessary, he claims.

Oregon – Statewide law goes into effect July 1, 1986. Voluntary program begins July 1, 1984.

Utah – Provo and Salt Lake City are being evaluated as sites with emissions problems. State authorities currently are evaluating test results gathered last winter.

Virginia – Town of Virginia Beach officials launching study to inventory stove emissions.

Washington – Department of Ecology emissions monitoring program underway. Control strategies being assessed for possible introduction in the next legislative session. Officials working closely with wood energy groups.

Michigan – Department of Natural Resources has installed air monitoring machines in the town of Mio.

Minnesota – Statewide emissions monitoring program launched. No statewide legislation expected.

Montana – State officials are weighing proposals to regulate wood heaters. Bills are expected to be introduced in the next session of the legislature providing tax credits. Missoula's much-publicized emissions law faces a ballot test in November.

Nevada – Division of Environmental Protection eyeing Oregon developments. Several towns have voluntary regulations, including Tahoe.

New Mexico – Emissions inventory of Albuquerque recently completed with EPA funds. Results were inconclusive. No statewide legislation planned.

Northeast – Regional wood energy center will make policy recommendations to the Coalition of Northeast Governors in October on how to best control stove emissions.

Wisconsin – Small-scale emissions monitoring underway in several towns.

Wyoming – Studies underway by the Department of Environmental Quality. Oregon standard being reviewed. Air quality chief says he is watching Colorado and Oregon's action with interest. □

to be done at different specified heat outputs so that the data could be interpreted for different climates. A weighted average characteristic of Oregon problem cities (Portland and Medford) was used to determine compliance with the standard. The law required all woodstoves, cookstoves, and fireplace inserts sold in Oregon to pass a test certifying not more than 15 grams/hr emissions for non-catalytic stoves and 6 grams/hr for catalytic stoves. In July 1988 the standards will change to 9 g/hr and 4 g/hr.[7] All new stoves sold must have a permanent certification label plus a removeable label giving information on average emissions and efficiency levels. The labels include a simple graph of the burn characteristics (see Appendix 2). The standards do not apply to used stoves, already installed stoves, central heaters, or fireplaces (Maviglio 1984).

Oregon's DEQ predicted it would cost $6000 to certify each stove design (a figure twice that originally estimated) in order to satisfy the stove industry's desire to provide expanded information for other parts of the country and thus avoid repetitious testing costs (Maviglio 1984). This additional information included setup, operations, and heat efficiency determinations (Kowalczyk 1984). Many felt that the 1988 9 g/hr standard (non-catalytic) could not be met

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[7]The tighter standard for catalytic converter stoves is based on the assumption the converter will degrade over time. Regulations require 70% converter efficiency after 5000 hrs for certification with a two year free replacement warranty.

with existing designs (Crasilneck 1984). In fact, the first non-catalytic stoves to meet the 1988 standards used a pelletized wood fuel system. Actually, Oregon had considered a phase II standard of 3 and 7.5 g/hr for catalytic and non-catalytic stoves but this was rejected due to woodstove manufacturers' objections (personal communication from Robert Lebens, Oregon DEQ, August 1986). The legislation was not intended to be "technology forcing" yet it took much development for most manufacturers to reach the standards. A summary of stoves meeting 1988 standards is given in Appendix 2. Six non-catalytic stoves had surpassed the 1988 9 g/hr standard as of May 1986.

Colorado in February 1985 became the second state to pass similar legislation. Its program is similar to Oregon's in that: 1) particulate standards must be met before a new stove is sold in Colorado; 2) emission standards are applied in two stages (Phase I Jan 1987 and Phase II July 1988); 3) the Oregon OM7 test method may be used for certification; and 4) stove testing is done by private laboratories certified by the state.

Colorado incorporated many elements of Oregon's woodstove certification program and in addition required that testing laboratories rather than the state (as did Oregon) verify that the stoves certified were those actually on the market. In doing so Colorado was able to implement its program at comparatively little state expense (Wood 'n'

Energy February 1985). There are elements of the Colorado program that differ from Oregon's, however. Probably the biggest factor is the effect of altitude on emissions. Sheldon Energy Research conducted studies to determine an appropriate factor to relate low altitude test scores with emissions at higher altitudes. (Colorado uses 5,000 feet - where most population exposure occurs - although certain localities with RWC emission problems are at a much higher elevation.) This conversion factor remains questionable. Colorado also has a much colder climate than Oregon, and consequently uses a different burn rate weighting formula. It also allows for a slightly different standard for "very large" stoves with a minimum burn rate greater than 4,000 BTU/hr.

Another fundamental difference from the Oregon program is that Colorado set standards and required testing for CO emissions. Although most manufacturers are finding that CO compliance is usually reached if TSP standards are met, some non-catalytic stoves may have trouble meeting the Colorado Phase II CO standards (Gay 1986). (Colorado does not differentiate between catalytic and non-catalytic stoves in its standards.) Conceptually then, whereas Oregon's standards were developed to meet NAAQS (i.e. performance standards), Colorado's were based on best available control technology (BACT) and in fact may be "technology forcing" for non-catalyst stoves. A comparison of the Oregon and Colorado standards is given in Table 14. Note that Colorado

Table 7

CONTROL OPTIONS

Decision Factors	1-Weatherization	2-Limit on Number	3-No Burn Days	4-Visibility Limits	5-Subsidies	6-Seasoned Wood	7-Public Education	8-Mandatory Emissions	9-Mandatory Efficiency	10-Retrofit	11-Performance Rating	12-Economic Incentives	13-Regular Inspections	14-Stove Industry	15-Listing Bi(a)P
	Effect of Control Options on Objective Criteria														
NAAQS Compliance	+	0	++	+	+	++	+++	+++	++	+++	+	++	+	+	+++
Health Effects	--	+	++	+	+	++	+++	+++	++	+++	+	++	+++	0	+++
Visibility	+	+	+++	+++	+	+	++	+++	++	+++	+	++	+	+	+++
Energy Policy	++	0	-	0	--	++	+++	++	+++	+	+	++	+	0	---
Equity and Income Group Distribution	+++	-	--	0	+++	0	+	---	--	---	0	++	+	0	---
Fire Safety	+	+	0	0	+	+++	+++	+++	++	++	+	+	+++	+	0
Indoor Air Pollution	--	+	0	0	++	++	+++	0	0	0	0	0	+++	0	+
Economic Development	0	0	++	++	0	+	+	+++	++	+++	+	+	+	+	+
Cost	---	-	-	-	--	0	0	---	--	--	0	--	-	0	---
Public Acceptance	++	-	--	-	--	+	+++	---	--	---	++	0	--	0	0
Administrative Feasibility (Not cost)	---	-	--	---	-	---	--	--	--	-	-	-	---	0	---
Total of Indices	0	0	+1	+2	+2	+11	+20	+6	+5	+5	+8	+9	+8	+4	-1

Key - + positive effect
0 no effect or effect unknown
- negative effect
Where possible, degree of effect will be indicated by: slight + or -
moderate ++ or --
significant +++ or ---
These evaluations aree subjective and for rough comparison purposes only.

allows for an alternative test method, the ASTM or "hybrid" method, and has allowed for the test differences in its standard. This was hailed as a major victory for the wood heating industry's voice, the Wood Heating Alliance (WHA) (Wood 'n' Energy, July 1985). Colorado also seems to use an altitude conversion factor of 1.3 for Phase II compliance although a factor of 2 is used in Phase I.

Voluntary compliance began in July 1985. Colorado will essentially require that Oregon's 1988 catalytic standards (4 g/hr) be met by July 1987. A reciprocity agreement was reached allowing Oregon-approved stoves to be certified in Colorado although there are obvious differences in the standards. This will save stove manufacturers additional expense. (Wood 'n' Energy February 1985.)

Unlike the Oregon Law, the Colorado bill requires the air quality control division to designate voluntary no-burn days in any non-attainment area of the state. Additionally, amendments offered in the House Committee report would require every municipality to enact a building code provision by July 1987 to regulate the construction and installation of fireplaces "in order to minimize emissions" according to design specification to be determined by the air pollution control division (originally) by July, 1986 (Colorado, [House Committee of Reference Report] 1984). If fully implemented, these fireplace standards would affect what may be a significant contributor to RWC emissions in recreation areas. A bill postponing the effective date of

the Colorado woodstove emissions from January to April 1987 and fireplace regulations for one year was vetoed by Governor Richard M. Lamm. The bill was originally intended to apply only to fireplaces and was a result of a delay in a $75,000 EPA research grant that made the July 1, 1986 date impractical to meet. Those opposed to woodstove regulation lobbied for a delay in the woodstove portion as well. Several stove retailers in fact had lobbied against the bill since they were already working hard to get certified stoves in by the deadline. A veto override failed by one vote, and now Colorado has a fireplace certification program but no standards - although the state health department is working on a performance standard (Wood 'n' Energy, July and August 1986). In short, Colorado encourages further local controls while setting a statewide standard on basic stove design.

In February 1986 the Montana Department of Health and Environmental Sciences (DHES) proposed to limit the sale of new woodstoves statewide through a certification program similar to Oregon and Colorado. Emissions were to be based on levels necessary to maintain compliance with proposed federal PM10 standards which are expected to be exceeded in 10 Montana communities. DHES is particularly concerned with RWC -related POM emissions, and plans to ban the burning of materials in stoves which can cause especially toxic emissions (such as plastics, treated wood, or refuse). There were also concerns with CO NAAQS 8-hour attainment in

Missoula, the reduction of creosote related fires, and the capacity to accommodate future economic growth.

The state of Montana had already in 1985 extended an existing alternate energy tax credit program to include "wood or biomass combustion devices" with particulate emissions less than 6 g/hr. Credits apply to purchase and installation costs at 10% up to $1,000 and 5% for the next $3,000. As of January 1986, 16 stoves had been approved for this credit by the DHES (Gay 1986).

A few other strategies for reducing RWC emissions have been attempted by states. Because stove operation is a critical factor in emissions, user education programs were felt to be promising. Oregon, Montana, Colorado and Vermont have published brochures on how to burn wood efficiently (Roper 1984). Regulating fuel wood moisture content has also been suggested but not implemented at a state level. Local regulation has experimented with these and other innovative strategies. Figure 7 summarizes state and local action.

LOCAL CONTROLS

Because of the lack of federal or state regulations and because woodstove emissions are aggravated by geographical conditions, several particularly susceptible communities were the first to establish wood smoke regulations. Because of their novelty, many of these regulations were ineffective and haphazard. However, local regulation may be necessary in certain instances since local meteorological conditions may require stricter control than statewide or national regulations.

Vail, Colorado was one of the first communities to be concerned with RWC emissions. In 1979 Vail limited the number of stoves or fireplaces to one per lodge, hotel, or dwelling and set certain heat efficiency requirements.[8] Pitkin County, Colorado first regulated woodstove emissions in 1980, but since its largest community (Aspen) was exempt from the regulations as an incorporated area, the law was not considered effective (Michaelson 1980). In September 1985, however, Aspen adopted an ordinance limiting buildings to one certified wood burning device with certain exemptions. Pitkin County tightened its rules, allowing a non-certified device (including fireplaces) only if

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[8]Vail required a heat circulation pump and outside combustion air feed to reduce heat loss, since indoor combustion creates a partial vacuum which will draw an equal amount of cold air in from the outside.

emission reductions in existing devices were reduced in the amount of three times that expected in the non-certified device. Nearby Beaver Creek resorted to banning wood fires (Loh 1984) and even considered monitoring emissions with individual sensors in each chimney connected to a central computer (personal communication from Harriet Ammonn, U.S. EPA). Steamboat Springs, Colorado was considering an ordinance mandating registration and retrofitting of every woodstove within the city with a certified emissions control device. Low interest loans programs were being sought at local banks. A controversial draft rule required that fireplaces as well meet Colorado's Phase II standards or be rendered permanently inoperable.

Telluride, Colorado (elevation 8,800 feet) probably has the most strict RWC regulations. A series of ordinances in August 1984 included the following provisions:

1. A moratorium on new solid fuel burning device permits until completion of modeling studies in May of 1986.
2. Permits will be issued only for devices certified by Colorado Phase II requirements, weighted for Telluride's altitude and climate requirements.
3. No coal may be burned after October 1988, nor coal stoves sold after October 1985.
4. Only one device is permitted per structure.
5. Open fireplaces are allowed only at one per hotel, multiple dwelling, saloon or restaurant.

6. No building permits may be issued without compliance with the above plus a payment of a one-time fee of $75 per g/hr particulate emissions (based on stove certification tests).
7. Existing fireplaces must be retrofitted with certified inserts by September 1988.
8. Permits may be sold but two purchased permits are required to burn one additional solid fuel burning device resulting in a two to one reduction in permitted stoves.
9. A deed restriction must be created forbidding use of any RWC device when a permit is sold which would deny a new owner the right to use a woodstove.
10. Rebate programs are created to encourage conversion to gas, propane or electricity.
11. Penalties may be imposed of up to $300 in fines or 90 days imprisonment per day of violation.

(Gay 1986)

Missoula, Montana, after trying voluntary compliance for two years with only a 30% success rate, voted in November 1984 for strict regulations (Peterson 1984 and personal communication from Steve Maviglio, Wood 'n' Energy). Its recently amended program currently includes:

1) Visible emissions limits within an "air stagnation" (AS) zone; No visible emissions are allowed during air pollution episode alert except by permit.

2) Mandatory episode controls within a smaller "high impact" (HI) zone.

3) Permit requirements to operate a RWC device within the AS zone.

4) Emission standards for new RWC devices.

5) Fuel restrictions.

6) Enforcement with fines up to $100.

Various permits include a class I for "lowest achievable emission rate" defined as less than 6 g/hr before June 30, 1988 and less than 4 g/hr afterwards based on Oregon test methods. Class I permits must be renewed every two years to ascertain that the device meets requirements (i.e. that the catalytic combustor is functioning properly). Class I permits may burn during episode alerts in the HI zone if visible emissions do not exceed 10% opacity. A Class II permit is given for "reasonably available control technology" defined as less than 15 g/hr based on the Oregon test method. A Class II permit is required after July 1, 1986 to install a new RWC device inside the AS zone. Fireplaces are included in this definition. Helena is the other Montana community to regulate RWC by banning use during TSP or CO alerts and strongly discouraging coal use.

In addition to the above high impact states, other communities have set regulations. Placer County, California has proposed requiring that new RWC devices be certified after TSP and PM10 monitoring indicated a RWC emission

problem. Juneau, Alaska strengthened its existing RWC program in 1985 with a permit system modeled after that of Missoula. Retrofit catalysts can be used to obtain a Class I permit. Catalytic devices must have a permanent temprature sensor to ascertain catalyst integrity. Reno, Nevada and Methow Valley, Washington have also enacted RWC control programs based on Oregon or Colorado certification combined with local permits and use restrictions.

On the other side of the country, the Village of Great Neck Plaza, New York has banned the use of wood or coal burning stoves for space heating. Fireplace use is curtailed where it can "impact adjacent high rise dwellings" (Gay 1986). Northampton, Massachusetts has limited RWC emission to 60% opacity except during startup.

Other local controls include building code regulations which specify fireplace and chimney design. This is not considered a significant pollution control. However, building codes as well as zoning regulations are available vehicles for local control. In 1984, the National Fire Protection Association (NFPA) revised its NFPA 211 guidelines for the installation of chimneys, fireplaces, and solid fuel burning appliances (woodstoves). These included specifications for passing chimney connectors through combustible walls, clearances wall to pipe, stove or insert installations into fireplaces and masonry chimney construction. Underwriters Laboratory (UL) also has a long

list of RWC related safety specifications which stove manufacturers must already comply with by Consumer Product Safety Commission (CPSC) regulations. These are basically hot burn tests to ascertain that standard setback recommendations (stove to wall) are indeed safe and that stove integrity is maintained. CPSC has also conducted studies on prefabricated metal chimneys; over half of all woodstoves use this type of chimney.

Product liability is also a vehicle for control. Some insurance companies already increase rates if wood heat is used, and one Pennsylvania company bans metal chimneys (Wood 'n' Energy, August 1985). Since chimney fires can be caused by creosote buildup, which is directly proportional to emissions, it is not unlikely that fire insurance could be increased for high emission stoves once an alternative is readily available.

OBSERVATIONS

Various regulations outlined here are concerned with issues relating to health, economy and efficiency. Woodstove certification is the predominant control measure although various methods have been used in a variety of combinations. How these or future regulations impact specific demographic groups, and how they affect total energy use, have not been extensively studied. Programs such as TVA's low cost loans to help homeowners buy woodstoves may in fact have increased NAAQS compliance

problems, although this program has been suspended in problem areas. High design and testing costs favor uniform standards. Yet a nationally coordinated assessment of the goals and objectives is appropriate before implementing an effective RWC emission policy. Individual states are responsible for establishing their own means of attaining NAAQS compliance, and local communities may still require additional locally mandated controls, but such efforts would be more effective if coordinated on a national level.

CHAPTER III

POLICY OBJECTIVES AND CONTROL ALTERNATIVES

> Alice: "Would you tell me, please, which way I ought to go from here?"
> Cheshire Cat: "Well, that depends a good deal on where you want to get to."
> Alice: "I don't much care where..."
> Cheshire Cat: "Then it doesn't much matter which way you go."

Before considering possible control alternatives it is appropriate that the long-range goals of any control program be examined. The consequences of any RWC emission control strategy can have far reaching effects, and these should be weighed according to decision factors defined by specific objectives. Not all of the ramifications of RWC emissions are directly related to a national strategy but they are of concern to those responsible for coordinating national policy with state or local concerns. This chapter will identify various national policy objective considerations and discuss how they relate to the various RWC control strategies, and discuss various methods of reducing RWC emissions, consider these objectives and methods with additional attention to public acceptance and administrative feasibility, and discuss the various action options EPA might take under the existing CAA.

POLICY OBJECTIVE CONSIDERATIONS

NAAQS Compliance

To the EPA, probably the most clearly defined objective of an RWC policy is regional compliance with the existing CAA and proposed particulate standards. Using chemical mass balance (CMB) receptor modeling source apportionment techniques it is possible to determine the relative impact of RWC on ambient air quality, and in particular on non-attainment. Given EPA's pollution offset policy for industrial development in non-attainment areas, RWC control could be a cost-effective alternative to industrial modification in specific "air sheds." Factor number one will assess compliance with primary and/or secondary standards for currently regulated air pollutants (i.e., CO and TSP at the lowest cost. NAAQS compliance has underlying aspects of health and aesthetics, but these will be considered separately.

Since meeting NAAQS is a specific goal, the degree to which the various control strategies meet this is at least theoretically quantifiable. Methods exist which - at least on a local level - could be used on a site specific basis to optimize an RWC strategy for NAAQS attainment at the lowest cost (see footnote 14). The other factors assessed here are at best less quantifiable.

Health Effects

Although CAA compliance presupposes health considerations, there may be associated health effects that

go beyond the CAA as presently administered. As previously discussed RWC emission particles may cause problems beyond those addressed by NAAQS. The mutagenic POM components in wood smoke exacerbate this concern. To complicate matters, recent evidence may indicate that the mutagenic components of RWC emissions are proportionally greater in converter equipped stoves (personal communication from Michael Osborne, U.S. EPA, March 1985).[9] Moreover, the quality of the ambient air affects the potential RWC health hazard since atmospheric reactions involving NO_x and ozone are known to increase the mutagenicity of wood smoke (Kamens 1984). On the other hand, wood smoke exposed to bright sunlight under low NO_x conditions showed 50-70% decreases in both mutagenicity and concentration of polycyclic aeromatic hydrocarbons (PAH) (Bell 1984). The rate of this degradation, however, decreases as temperature is lowered (personal communication from Richard Kamens, November 1986). The implication is that RWC emissions are more a health hazard in already polluted areas. Since these are generally areas of higher population, the human health risk is greater than otherwise indicated by polycyclic organic material (POM) measurements alone. Also, in heavily overcast areas, such as the Pacific Northwest, wood smoke mutagenicity will persist longer.

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[9]This may be due to the increased temperature. A similar effect has been noted in comparing the mutagenicity of diesel exhaust. (See Lewtas 1982).

Visibility

The most obvious effect of RWC in many areas is haze in the valleys. In some areas this can cause acute visibility problems, and many Colorado ski resort areas have regulated RWC primarily for these aesthetic reasons (with obvious concern for the tourist dollar). Visibility relates closely to emission opacity which is relatively easily measured. The visibility factor considers the impact on aesthetics, tourism and public perception that any regulation strategy would have.

Energy Policy

The contribution of RWC to total energy costs can be affected by any control policy. Restrictions on woodstove use will necessitate increased energy use from other sources. Nationwide, about 8 percent of households use wood as a primary heat source (Nero 1984). In specific localities figures can be over 50 percent. Information such as given in Table 7, and methods outlined in footnote 14 can be used to relate changes in RWC use to increased use from other energy sources.

Effect on Different Income Groups

RWC use can be categorized in a range from "recreational" (open fireplaces which may have a total negative heat value) to primary (where it may be the only heat source affordable). Consequently, various RWC controls will affect different demographic groups in different ways. Table 7 shows only a slight correlation between woodstove

use and income, with use leveling off with higher incomes. Fireplace use, however, is heavily correlated to income. Low income groups, for example, would be adversely affected by burning restrictions on high pollution days. Regulations restricting open fireplaces would affect higher income groups. Economic assistance programs might be especially beneficial to lower income groups. Programs such as energy tax credits for low emission stoves would benefit low income groups more than loan programs or "tax deductible" programs. However, any such assistance programs should assess the possible increase in total emissions from increased stove use.

Fire Safety

Heating with wood is responsible for a large number of winter house fires. Strategies which would decrease RWC emissions would also decrease this risk. Basically, there is a one-to-one relation between emissions and the creosote buildup which is responsible for most chimney fires. Proper installation of woodstoves, such as diameter and length of exposed pipe and chimney connections, also influence safety and emissions. Fire safety is thus both a factor for consideration as well as an authority for control. Various control strategies would affect this factor differently. Control options such as chimney inspection and consequent mandatory cleaning, which are already implemented in West Germany (Greene 1981), could be an important incentive to

the use of both lower emission stoves and better operator practices.

Indoor Air Pollution

Control alternatives impacts on indoor air pollution do not necessarily follow the impacts on outside health effects. For example, a required catalytic converter retrofit could result in significant indoor releases when the firebox is improperly opened for refueling, due to restriction in draft. Controls requiring mandatory inspection could reduce stovepipe leakage from faulty installation, a primary cause of indoor emissions. Other emission-reducing strategies might also have an adverse effect on indoor air pollution. Weatherization programs reduce the total air exchange rate and could significantly increase indoor concentrations of RWC related emissions as well as other household pollutants, such as tobacco smoke and formaldehyde emissions. A well-insulated home can have air exchange rates several orders of magnitude below older homes. Although heat exchangers can improve ventilation heat efficiency, their use is rare in residential buildings and assistance for such devices would be hard to include in weatherization programs. Programs that would improve stove operation practices, either automatically or through user education, would be most effective in reducing indoor air pollution. Along with faulty installation, this is the primary cause of indoor emissions (Weston 1984).

Economic Development

Any regulation of RWC emission will have an effect on the economy of an area. The effect, however, may be site-specific. For example, NAAQS compliance in non-attainment areas could increase potential business development in some areas, whereas strict building requirements in another area could inhibit local development.

Cost

A final and important factor is the cost of a control strategy. Apportionment of indirect costs will not be considered here, although the total societal cost and/or Pareto efficiency of a control option is an important consideration. There is, however, an immediate and significant transition cost to the woodstove industry. The cost considered here is the initial cost to the stove user or to government for subsidy programs. Other cost distributions are implied above under fire safety and economic development.

Forest Biomass Removal. Burning wood as fuel in principle substracts an equivalent amount of wood that would otherwise be left to decay and enhance forest substrata. Concerns have been raised regarding the impact of increased RWC on forest ecology (Bohac 1981). Programs that greatly increase wood use should include considerations to insure efficient and environmentally sound wood harvesting techniques. It is not likely, however, that any strategy

designed to lower RWC emissions would significantly increase wood use. Fuel-wood cutting on a small scale (as is usually the case with RWC) can, in fact, improve wood lot production. Also, since log sizes greater than 4 inches in diameter burn cleaner, taking these and leaving smaller brush in the forest would not greatly reduce biomass. For these reasons, forest biomass considerations are probably not important in wood emissions control strategies and are not listed here as a factor for assessment.

METHODS OF EMISSION CONTROL

Fundamentally, total wood smoke emissions can be decreased by two approaches: reduction in woodstove use or increased heat/emission ratio. A discussion of these approaches is pertinent to assessing control strategies. A summary of existing control measures is given in Table 15 for reference. Additional alternatives will also be considered.

Use Reduction

Control strategies already using the first approach include:

1. Home weatherization programs,
2. Restriction on use, such as
    a. limit on number of units per dwelling
    b. restricted use on high pollution days
    c. visible emission restrictions (this is also an indicator of stove efficiency), and

Table 15

CONTROL STRATEGY ELEMENTS IN USE/PROPOSED

Element	Areas in Use/Proposed
Public Education	Alaska; Oregon; Missoula, Mt; Colorado (ski communities & elsewhere); Reno, NV
Visible emission limits	Juneau, AK; Missoula, MT
Mandatory curtailment of use during high pollution episodes	Medford, OR; Missoula, MT Beavercreek, CO; Reno, NV; Juneau, AK
Voluntary curtailment of use during high pollution episodes	Reno, NV; Albuquerque, NM; Vail, CO; Juneau, AK
Reduce wet wood burning	Juneau, AK; Medford, OR
Weatherization requirements or stove use	Medford, OR; Crested Butte, CO
Restriction on wood burning appliances:	
- Number of appliances	Telluride, Aspen, Vail, Crested Butte, CO
- Design standards	Aspen, Vail, Beavercreek, CO
- Emission standards (stove certification)	Oregon; Missoula, MT
- Residential permitting requirements	Missoula, MT; Beavercreek, CO
- Require alternate heating in new homes	Medford, OR

3. Energy subsidies for other fuel use.

Other design restrictions which impose additional costs on RWC may in effect decrease stove use due to decreased demand, but will be listed in the discussion of the second approach category.

Weatherization assistance reduces woodstove use by reducing heating needs, as in any other fuel. It can be in the form of direct grants or low interest loans. Weatherization requirements can be required for woodstove users or as a condition for other incentives, such as low emission stove subsidies. As already mentioned, weatherization can lead to higher indoor pollution levels, although it is presumed that such a program would concentrate on less efficient homes and not approach very low air exchange rate levels.

Restrictions on use, although applicable in particular localities, would be near impossible to impose on a national level. Limiting the number of stoves per dwelling could have little impact if not combined with other criteria, such as stove efficiency or weatherization requirements. "No burn days" could be a viable measure, but allowances for sole means of heat would have to be made and public acceptance of unequal requirements could be problematic. Visibility or opacity of emission requirements could require more or less arbitrary judgments by local officials untrained in opacity measurement techniques and could thus

be even more problematic, and effectiveness has been shown to be minimal.

Energy subsidies for other fuels could be used to dampen the switch to RWC if energy prices increase suddenly. This approach was used in Oregon, although its effects are not quantifiable (CONEG 1984). High cost and implications for higher energy consumption limit its long-term use. Its use is primarily a stop-gap measure but should remain in the "bag of tricks" should another sudden oil price rise occur.

Efficiency Increases

The second approach to emission reduction perhaps warrants more consideration. There are basically three variables in the emission equation: the fuel used, the stove design and the stove operation. All three factors can be critical to efficient operation. Whereas the stove design can be regulated by various methods, user operation practices and type of fuel used generally cannot. For example, only one of the first stoves certified in Oregon could not be operated in a polluting mode (Wood 'n' Energy, March 1985).

Efficiency related controls include:

4. Seasoned firewood requirements
5. Operator performance improvement, and
6. Stove design improvement through
    a. mandatory emission requirements for new stoves
    b. mandatory heat efficiency requirements for new stoves

c. mandatory catalytic combustor retrofitting to existing stoves
d. performance rating information for new stoves (both emissions and efficiency)
e. economic incentives for equipment replacement
f. regular inspection of stoves and chimneys with required cleaning and/or repair
g. voluntary efforts by the woodstove industry to improve stove efficiencies

Use of properly seasoned firewood can be mandated but is best encouraged through user education. Programs of user education and spring wood cutting have projected emission reductions of up to 38% from these strategies alone (Grotheer 1984). User education can also be effective in influencing proper stove selection. Many new stove buyers believe that bigger is better and then are forced to operate at a reduced air setting which produces the most emissions. The tradeoff is length of burn, but proper education stressing creosote buildup, fire safety and stovepipe lifetime could influence better overall stove operation. Merely increasing fuel wood size from 2-4" to 4-6" can decrease emissions by 30% (Grotheer 1984).

Stove design improvement is probably the control option of choice due to its direct relation to the problem and perhaps relative ease of regulation. For this reason, stove design warrants further discussion. Of the categories listed

under stove design above, a through c regulate emissions while d through g are basically incentives to purchase better stove designs. Mandatory emission controls and mandatory efficiency are analogous respectively to emission requirements and mileage standards for motor vehicles, in that mandatory heat efficiency (total fuel use, cf gas mileage) may be most effective as an emission control only when combined with emission requirements. Retrofit of catalytic converters may also sound familiar. However, woodstove converters add to the heat output thereby automatically increasing efficiency, as opposed to automobiles where the additional heat can be a problem. As with automobiles, increased back pressure can be a problem. Retrofit converters are available on the market but generally are less efficient and/or more problematic than built-in models.

National mandatory emission requirements for new stoves are basically new source performance standards (NSPS) under EPA's ongoing CAA enforcement program. In order for the EPA to set NSPSs, standard testing procedures must be specified as well as the emission standards. The specific standards must also reflect EPA's assessment of the woodstove industry's ability to meet the standards. Basically there are two woodstove design types that are most promising, catalytic and noncatalytic. Of the latter, only stoves of the secondary combustion chamber design are considered capable of meeting requirements. Emissions from secondary

combustion stoves, however, are somewhat dependent on burn cycle and operator attention. They do not perform as effectively at the low burn rates which are typical in home use. Catalytic converters, on the other hand, allow unburned flammable products to burn at a lower temperature. Operation begins at approximately 500° and is selfsupporting even when stove temperatures drop as much as 100° below this. The temperature of the converter will increase as long as fuel (unburned flammables) is supplied, allowing catalytic stoves to be more efficient at low burn rates. For these reasons a converter can increase the heat efficiency of a given stove 20%-30%.

Double standards were set by Oregon for converter and nonconverter stoves to reflect the limited converter lifetime. One study indicated that emissions of particulates increased 84% over a four-year equivalent life-span. Combustion efficiency decreased also but at a lesser rate (4%), and CO emissions reduction actually increased (Fisher 1986). These data somewhat dilute the assumption that it will be to the user's advantage economically to replace a converter after its effective lifetime, but only with respect to the chimney cleaning costs.

Other innovative designs, such as automatic pelletized wood feed and computer controlled draft and vent openings, have been developed and tested successfully. Although they not generally commercially viable alternatives, such low

production stoves may pose a certification problem if EPA initiates NSPSs. A $6,000 test fee could be an undue burden on a limited production model.

METHODS COMPARED WITH DECISION FACTORS

The control options are evaluated in Table 16 according to their relation to the decision factors listed in the beginning of this section. A seventh option is listed for evaluation, extending the CAA criteria pollutant list to include B(a)P. Indices given in this table are not intended to be specific: they are for illustrative comparison only, and this report claims only that they are an honest attempt to avoid over-quantification, which due to inaccuracies of much of the available data could be more misleading.

For clarity some explanation is appropriate regarding the assignment of index levels in Table 16. Five categories ranging from all negative (---) to all positive (+++) are used. The Control Options are thus compared as to their relative influence on each Decision Factor or objective. For example, as compared with its influence on meeting NAAQS compliance, control option 2a (limit on number of RWC per dwelling) is rated 0 mainly on the scale determined by the other options. A 1/2+ would be perhaps more accurate since there would be a slight positive effect. The "O" rating indicates that it is less effective than options 2b or 3 indexed as "+." Factor row 11, administrative feasibility, is rated all negative. That is to say more administrative

Table 14

COMPARISON[a] OF OREGON AND COLORADO WOODSTOVE EMISSION STANDARDS[b] (g/hr)

Column:	1	2	2	4	5	6	7	8	9	10
State:	Oregon		Colorado				Colorado			
Test Method[b]	Oregon		Oregon				Hybrid			
Program Phase:	I	II	I	I	II	II	I	I	II	II
Effective Date(s):	7-1-86	7-1-88	(1-1-87 to 6-30-88)		7-1-88	7-1-88	(1-1-87 to 6-30-88)		7-1-88	7-1-88
Pollutant:	TSP	TSP	TSP	CO	TSP	CO	TSP	CO	TSP	CO
Catalytic Stoves:	6	4	--	--	--	--	--	--	--	--
Non-Catalytic Stoves:	15	9	--	--	--	--	--	--	--	--
Stoves <40,000 Btu/hr:	--	--	30	400	12	200	22	400	8.5	200
Stoves[c] >40,000 Btu/hr:	--	--	$37+\frac{1}{1000}$	$800+\frac{10}{1000}$	$15+\frac{0.4}{1000}$	$400+\frac{5}{1000}$	$30+\frac{0.7}{1000}$	$800+\frac{10}{1000}$	$12+\frac{0.3}{1000}$	$400+\frac{5}{1000}$

a. The Colorado Standards were set with Colorado's higher altitude and colder climate in mind. "Equivalent" Oregon Standards would therefore be lower in magnitude, because of Oregon's lower altitude and milder climate. How much lower is difficult to determine, due to limited test data on various types of stoves in both states. Differences in the stove categories used, and other factors, further complicate evaluation of which state's standards are more stringent.

b. The Oregon and Colorado woodstove emission standards in the first six columns are based on the Oregon test method. Colorado also allows a different test method for particulates, called the "Hybrid Oregon/ASTM Method"> The Colorado standards in the last four columns above are based on this hybrid test method. Although the latter Colorao standards appear more strict than the former ones, they are considered equivalent. Their differences in magnitude occur because the hybrid test method dilutes flue gas with air before particulates are collected, and therefore the pollution numbers are always lower.

c. Example Interpretation (Column 3): Stoves with a minimum heat output of more than 40,000 Btu per hour cannot emit particulates at a rate (g/hr) above 37 + 1 g/hr for each 1000 Btu per hour heat output, if they are to be certified for sale or advertisement in Colorado during Phase I.

difficulty. For example, regular inspection of stoves and chimneys might be more difficult to implement due to public disapproval of privacy invasion. Thus the increased difficulty is more negative. Many of the relationships have been discussed previously in this report and some certainly deserve further explanation. However, space forbids a more detailed description of the choices made.

Disregarding the obvious inaccuracies and assumptions made, if one adds up the +'s and -'s in the columns, one finds that by this scale the most acceptable control options are (in order) public education, seasoned wood, economic incentives, mandatory emissions, performance rating and regular inspections. What is striking is a clear desirability of public education programs.

What is also striking, however, is that the objectives, i.e. decision factors, are certainly not all of equal weight. Moreover, different interest groups are obviously affected differently and would attach a different set of weights to the factors. While the matrix of Table 16 is a useful vehicle for analysis, it is not a formula for decision making without consideration of these weights and without more commensurate indices.

ALTERNATIVES FOR EPA ACTION

Given the above developments, it is clear that RWC emissions pose a problem that requires some EPA action. The basic option alternatives include:

1. Expand health research into the human health risk of RWC emission components beyond that assessed by present NAAQSs.
2. Expand assessment of NAAQS problem areas and develop site specific control strategies which include RWC considerations.
3. Establish a RWC information focus to develop effective user education type programs.
4. Develop or establish existing standard test procedures to aid in consistency.
5. Develop national suggested standards to aid individual state RWC regulations.
6. Develop non-catalytic stove technology.
7. Set formal NSPSs for woodstoves which would:
   a. Set a single standard reachable by existing non-catalytic stoves.
   b. Set different standards (as did Oregon) for catalytic and non-catalytic stoves, or
   c. Set a single standard related to best achievable control technology (BACT) forcing all stoves to meet rates set by existing catalytic stoves.

These alternatives are obviously not mutually exclusive and, in fact, a viable RWC policy would be a combined and coordinated collection of the above.

CHAPTER IV

INAPPLICABILITY OF TRADITIONAL EPA RULEMAKING PROCEDURES

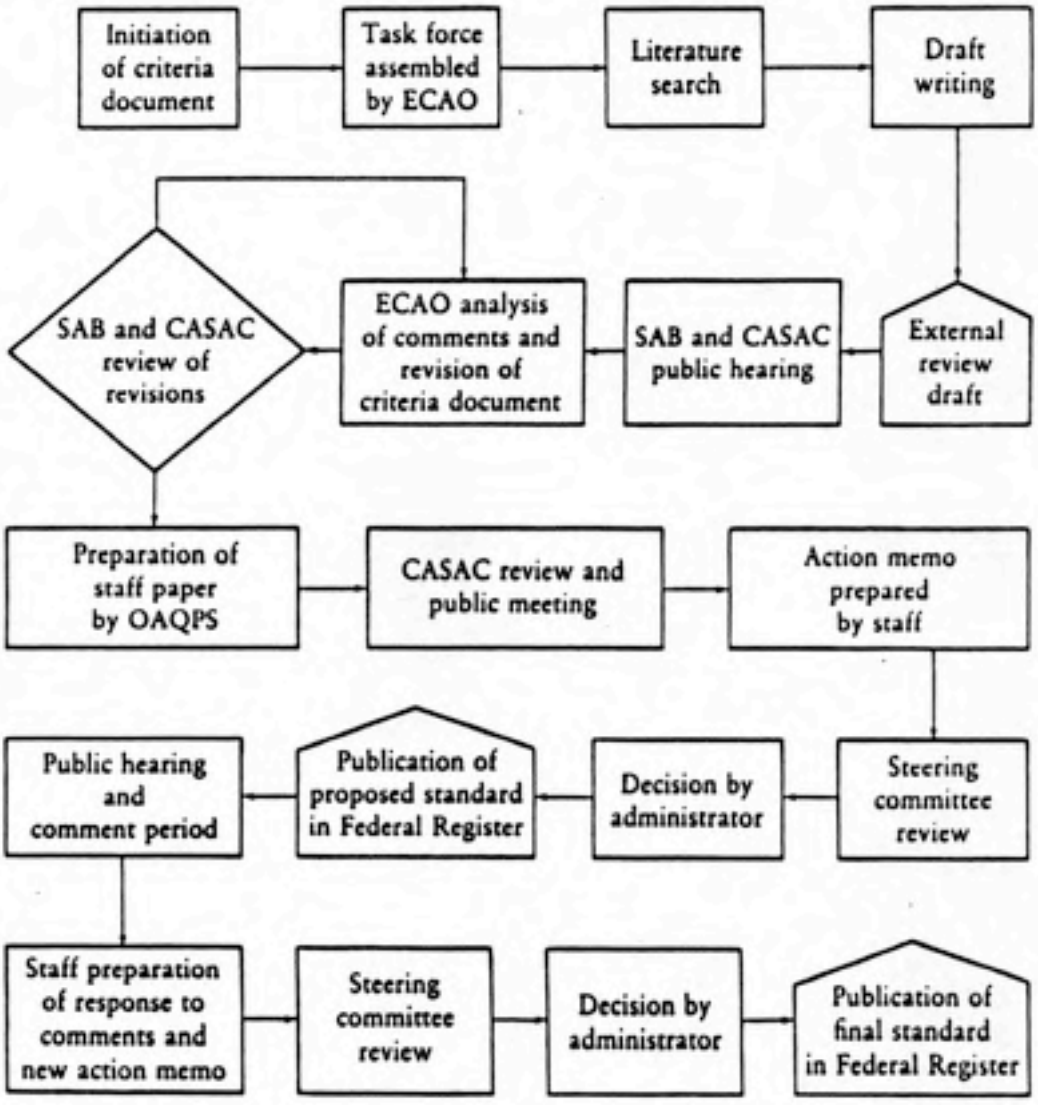
The RWC scenario does not exactly fit previous EPA control-enforcement experience. Ordinarily, when it is evident that an industry is a significant contributor to a pollutant for which national standards exist, EPA has the authority to issue new source performance standards (NSPS). In order to satisfy current court interpretation of the Administrative Procedures Act a significant amount of documentation is required to show both the significance of the contribution as well as the validity of the standards based on best demonstrated control technology or BDT. This is not different from the path EPA had already been following based on RWC contribution to NAAQSs for CO and PM10. In one aspect RWC is atypical in that the sources are many and are controlled at their point of manufacture rather than requiring user compliance as with larger power plants, but this is similar to mobile source regulations.

A major difference is the introduction of what proved to be the major driving force in RWC control action, EPA's out of court settlement with NRDC *et al.* for controlling polycyclic organic material (POM) to regulate woodstoves

(see footnote 1). Although POM is a class of potential (and some proven) carcinogens, specific standards have not been set for POM. Moreover, it is debatable whether the link between POM carcinogenicity and woodstove particulate emission profiles is well enough established to stand up to a scientifically rigorous proof. Most of the RWC emission data with regards to stove compliance have been developed (by Oregon and others) with CO and particulate emissions in mind. It is perhaps the case that the "out of court" nature of the settlement in fact reduces the "burden of proof" required for EPA justifying its actions to comply with the presumptions of the original court suit (i.e., failure to regulate POM). It is probably not the case that this would relieve EPA's responsibility to adequately explain its actions to other interested parties.

The introduction of the NRDC settlement also added a time constraint not explicitly present before. The traditional EPA NAAQS standard-setting process is circuitous and time consuming (see Figure 8). A similar process takes as long as five years to develop an NSPS. It is possible that the administrative procedures necessary to satisfy the rationale of the NRDC suit could actually take longer than would a process to regulate RWC emissions based on NAAQS attainment alone. Issuing NSPSs for NAAQS pollutant sources through traditional methods is a process with which EPA has considerable experience, however. Alternative methods of standard development are newer but EPA has been exploring

Figure 8. *The Standard-setting Process in the Environmental Protection Agency*



them. The NRDC suit in particular gave EPA added impetus to consider their applicability to RWC emission control.

CHAPTER V

ENVIRONMENTAL MEDIATION AND THE EPA

Since the concept of environmental mediation was introduced in a 1973 Washington State dispute resolution regarding a proposed flood control dam, much experience has been gained in over 160 attempts to reach negotiated settlements (Bingham 1986). The opportunity to gather opposing groups with different understandings of a specific problem has been urged in such situations as the siting of hazardous waste facilities (Smith et al. 1985; O'Hare et al. 1983). The multi-interest nature of environmental disputes is often conducive to a less confrontational approach than are other more fact- or rule- driven disputes where non-traditional rulemaking procedures often break down. Constrained by the ever-increasing labyrinth of the notice and comment process dictated by the Administrative Procedures Act of 1946, the EPA has been slow to respond when any of the facts are in dispute even when the issues are clear and when given specific dictates by Congress. Court decisions requiring a "hard look doctrine" (eg. Kennecott Copper Corp. v. EPA, 1972) have limited EPA's discretion in the use of "informal rulemaking," and many rules have been challenged in court (Berry 1984): EPA

Administrator William D. Ruckelshaus noted that about "80% of all the rules EPA issues [were] challenged in court" (Schneider 1985). Also, from another standpoint, it has been noted that "a process that does not provide for the resolution of technically controversial issues almost guarantees an agency will arrive at no decision" (Berry 1984 p. 44).

Recognizing these problems, the Administrative Conference of the United States (ACUS) adopted a resolution in 1982 formally recommending that federal agencies incorporate negotiation into the rule-making process under certain circumstances (Bingham 1986).[10] The ACUS elaborated on its goal:

> "[These] suggested procedures provide a mechanism by which the benefits of negotiation could be achieved while providing appropriate safeguards to ensure that affected interests have the opportunity to participate, that the resulting rule is within the discretion delegated by Congress, and that it is not arbitrary or capricious. The premise of the recommendation is that provision of opportunities and incentives to resolve issues during rulemaking, through negotiations, will result in an improved process and better rules. Such rules would likely be more acceptable to affected interests because of their participation." (Harter 1986)

EPA reacted quickly and in February 1983 published plans to proceed with its Regulatory Negotiation Project

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[10] "Regulatory negotiation" is a term that refers to use of negotiation in any decisionmaking process by an administrative agency. "Negotiated rulemaking" is a specific application of regulatory negotiation, referring to the use of negotiation in the decisionmaking process associated with rulemaking (Perritt 1986).

(RNP) - "an alternative that better conserves time and resources and minimizes costly litigation" (Federal Register Feb 22 1983 p. 744). The ACUS had advised that a limited number of interested parties would negotiate under the dictates of the Federal Advisory Committee Act (FACA) (Public Law 92-463), which defined an advisory committee as "any...panel...which is...established or utilized by one or more agencies, in the interest of obtaining advice or recommendations...." In keeping with the FACA, EPA must 1) formally charter an advisory board,[11] 2) announce meetings and allow the public to attend, and 3) keep an official transcript of the meetings (Berry 1984). The act also required that the advisory committee be "fairly balanced" and not "inappropriately influenced by any special interest." Importantly, it is the agency that officially writes the regulation and the negotiations "are a step in the 'informal notice and comment' administrative procedures EPA uses presently" (Federal Register, February 22, 1983 p. 7494).

The Regulatory Negotiation Project was to be both investigatory and demonstrative, but some basic guidelines had already been developed "after a thorough review of the considerable literature:"

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[11] This charter must first be approved by the federal Office of Management and Budget and then filed with Congress.

1. The proposal requires the resolution of a limited number of interdependent or related issues. There are several ways in which the issues can be resolved. The relevant legislation incorporates these alternative outcomes. There are no serious obstacles to implementing a negotiated settlement.

2. There is a legislative or judicially imposed deadline or some other mechanism forcing publication of a rule in the near term, i.e. 8 to 12 months, that would promote a timely resolution, and limit a party's ability to gain from delay.

3. Some or all of the parties have common positions on one or more of the issues to be resolved that might serve as a basis for additional agreements during the course of negotiations.

4. The costs and benefits are narrowly concentrated on a few entities.

5. Those parties interested in or affected by the outcome of the development process are readily identifiable and reasonably few in number (10-15). They have sufficient resources to take part in negotiations. They have relatively equal power to affect the outcome.

6. The parties are likely to participate in negotiations as an alternative to litigation. They are more likely to achieve their overall goals using negotiations rather than existing alternatives.

(Federal Register, February 22, 1983 p. 7495)

With the potential field fairly well narrowed, NRDC attorney David Doniger soon proposed that heavy duty diesel engine emission nonconformance penalties (NCP) was a suitable subject for regulatory negotiation (reg-neg) after meetings with EPA, the environmental community, and the NRP designated outside convenor/facilitator, ERM-McGlennon of Boston. In the spring of 1984, EPA selected NCPs as the first of two reg-neg demonstrations. After a period of four months, a committee of 22 members reached a consensus. The

committee included 16 representatives from the trucking industry, two state air pollution control agencies, NRDC and the EPA.

ERM-McGlennon also "convened" the second demonstration negotiation, a long standing question involving the need to revise a rule allowing emergency exemptions to federal pesticide licensing under section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). special assistant to EPA's General Counsel, LaJuana Wilcher, served as facilitator. Potential "stakeholders" included environmental groups, national coalitions, and state officials as well as U.S. EPA, the Dept. of Agriculture (DOA) and pesticide users. Again, a consensus was reached after four months of negotiation.

In these two processes, criteria were established for selecting the participants. These included: 1) the party's interest in the issue, 2) the potential impact of the new regulation on the party, and 3) whether or not the party's interests were represented by other groups (Schneider 1985). EPA had published additional criteria requiring that: 1) parties be at the preproposal state of development, 2) a relatively small number of parties are willing to come to the table, 3) a limited number of specific issues are present, and 4) a near term deadline for publication of the regulation exists (Federal Register, April 24, 1984). Protocols for negotiation had also been drafted in cooperation between EPA Project Manager Chris Kirtz and

Washington D.C. attorney Phillip Harter, and these had been sent in advance to the participants for consideration. Specific rules of order were agreed upon later by the negotiators. For example, both sets of participants eventually concurred on procedures to handle the two $50,000 resource pools.[12] According to one commentator, "Without the funds to reimburse parties for travel costs it is unlikely that either of the negotiations would have occurred. The availability of such money contributed to the stakeholders' sense that there was relative equity among the participants" (Schneider 1985 p. 75).

Much experience was gained in these two demonstrations. EPA "learned that parties responsibly used the latitude [given] them to fashion their own operational protocols or ground-rules, to determine how they [wanted] to use their available resources, and even how to define what they mean by 'consensus'" (Kirtz 1985). Both the use of an outside convenor (NCP) and a combination of in-house and outside convenor/facilitator (FIFRA) were shown to be successful, even though the ACUS had recommended that a convenor be designated who is "rigorously neutral with respect to the subject matter of the rule" (Harter 1985). (ERM-McGlennon

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[12] To aid in its own efforts at negotiated rulemaking, the USEPA established a fund administered by the National Institute for Dispute Resolution to pay the expenses of public interest group participants and the costs of technical assistance jointly requested by all the participants (Bingham, 1986).

noted that a team of negotiators is more appropriate for a large committee where assistant mediators may be assigned to working groups (Schneider 1985)).

Phillip Harter has summarized factors which a convenor may look for in choosing subjects for a negotiated regulation:

- The number of interests that need to be directly represented should not exceed 15-25 (others can be accommodated by means of teams or caucuses).
- Each interest must be sufficiently organized that it can select individuals to represent itself.
- The issues must be "mature and ripe" - crystallized such that the parties can focus on them.
- There must be a realistic deadline, usually in the form of an agency commitment to move ahead on its own if sufficient progress has not been made in negotiations.
- No party must have to compromise on an issue fundamental to its existence.
- Each party must feel that a negotiated settlement is its best alternative.[13] For example, if future research would be determinative of the outcome, this uncertainty would lead some parties to delay.

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[13]The concept that each party must feel that negotiation can enable it to at least meet its best alternative to a negotiated agreement (BATNA) is described in Henry Perrit's "Negotiated Rulemaking in Practice" (1986).

- The agency must be interested in developing a rule through this process and will appoint a relatively senior official to represent it, and
- The parties must agree to negotiate in good faith.

(Harter, 1986)

EPA administrator Lee Thomas has further stressed that if a group negotiates a consensus rule, there has to be a firm understanding that the agency will go forward with the rulemaking process. "It is a formal process and all the formalities have to be followed in establishing the advisory committee, soliciting invitations to participate in an open public fashion, and then running the process in that same fashion" (Thomas 1986). Administrator Thomas also stated that negotiation should be institutionalized at the "front end" of the regulatory development process. EPA is thus committed to utilizing negotiation in rule-making, when a careful assessment of the overall situation indicates that it will be successful. There is the potential to shorten rulemaking time and, more likely, to achieve a better rule less prone to challenges.

The similarities between reg-neg and the traditional rulemaking process are expressed in a letter from EPA's Jack Farmer (Director Emission Standards and Engineering Division, OAQPS) to frequent RWC reg-neg meeting attendee Dr. Lawrence Cranberg:

> "The reg-neg process is not an attempt to circumvent the normal rulemaking process, nor

does it undermine public participation. It is supplemental to the normal process and in fact, is more public than our normal procedures in that all meetings are publicly announced beforehand and open to anyone interested in attending. The negotiations will lead to a proposed standard, after which there will be a public comment period and a public hearing ... standards will be revised, if appropriate, and a final rule will be issued .... Finally, the standards are revised every four years and amended if revisions are necessary." (Mar. 13, 1986, RWC Docket)

CHAPTER VI

APPLICABILITY OF A NEGOTIATED REGULATION TO RWC

Although the NRDC suit agreement and the need for a "fast track approach" affected EPA's decision to consider mediated negotiation, other peculiarities of the RWC emission scenario also lend themselves to this method. Traditional EPA rulemaking procedures are not conducive to dealing with a broad array of interests. Comments are received but there is no clear method to weigh the interests of the various commentors.

Chapter 3 summarizes the multi-objective nature of RWC emission regulation and in Table 16 suggests a crude method to determine the combination of control alternatives that would best satisfy the various objectives or decision factors.[14] It is obvious, however, that even for this simplistic model, a method to weigh the relative importance of the factors is lacking. Clearly, a method is needed in

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[14]This approach to decision analysis is called multi-objective programming. When suitable "objective functions" for each interest are well defined and if the appropriate relative interest weights can be agreed on, it is theoretically possible to solve mathematically for an "optimal" solution using linear programming techniques (see Cohen 1978 pp. 13-28).

which the relative concerns of the different factors can be weighed.

There are many parties with various interests involved in RWC emission control. Various control strategies will obviously affect groups differently. What may be of slight benefit to one group may be a severe detriment to another while an alternative solution may be less onerous. When many groups are involved the complexities increase but it is possible to minimize adverse effects and maximize benefits if the facts are clearly communicated. In the parlance of systems operations this procedure is known as multi-objective programming and quantitative facts are required.

Similarly, the RWC scenario is a multi-objective problem. Environmental interests are concerned with minimizing POM emissions while various state air pollution agencies are concerned with meeting NAAQSs; for some groups fire prevention is of more importance while for others, accurate information for the consumer is a priority. Obviously a forum is needed in which the concerns can be voiced and then relative importance (weights) can be assessed.

Mediation appears to be such a process and a regulatory negotiation is such a forum. From the "stakeholders'" point of view, mediation offers an opportunity to be involved in the decision process. From the agencies' point of view, negotiation offers the possibility of a faster rulemaking schedule and hopefully a better rule - more durable and more

workable. Mediation has not been fruitful in all instances, however, and the RWC scenario should be assessed in view of the various observations described in chapter 5.

The out of court agreement with New York State and NRDC provided the impetus for what may be the most important criterion for negotiation success, namely an imposed time constraint (assuming that "success" is the reaching of an agreement). This in effect required the EPA to set a standard regardless of whether a consensus was reached. Thus the EPA had every reason to reach a consensus since this would improve the "durability" of any rule, a major vulnerability of any "fast track" approach.

Such a driving force behind only one "stakeholder" does not guarantee that agreement will be reached. The woodstove industry was, however, in what may not be a typical position for a regulated industry. Reminiscent of mobile source regulation, with several states having already set disparate standards and with several others seriously considering implementing unknown standards, the woodstove industry needed a national standard that was strict enough that individual states would not feel the need to regulate more strictly.

Other "stakeholders" also were under pressure to reach an agreement. The NRDC, of course, wished to bring its out of court agreement to fruition, although it could still hold out for a more strict rule. The individual states, however,

were faced with the pending problem of PM10 attainment scheduled tentatively for 1987, and needed the RWC emission prediction figures to plug into their State Implementation Plans (SIPs). Moreover, they needed regulations strict enough to affect PM10 attainment but not so strict as to price new woodstoves off the market thus eliminating a changeover from polluting stoves. The currently non-regulating states would also like to avoid the expense of initiating their own RWC emission programs.

Most other criteria for regulatory negotiation (reg-neg) listed in chapter 5 are also essentially met. Primary "stakeholders" EPA and NRDC had already been to court, while the woodstove industry could not afford the time nor the cost of lengthy litigation. Thus these participants had either already exercised their best alternative to a negotiated agreement or had determined that negotiations were preferable to their "BATNA" (see footnote 13).

Also, EPA had, in prenegotiation, set certain bounds and identified issues to be negotiated. Their considerable background work, as well as the work done by Oregon, had already fairly well defined the issues and the several options available for each. Many "stakeholders" in fact had common positions on many of the issues, and there were to be "strange bedfellows" in some debates. Other criteria, such as the appropriate number of "stakeholders" and a limited cost benefit array, were also essentially met.

The cost-benefit equations for RWC regulation can be complicated and beyond available data, yet EPA's "Section 114" surveys[15] and the subsequent woodstove demand function simulations done for the committee were more detailed than any previously available.

Some of the criteria were clearly not met. It is debatable whether or not these are problematic. Probably not a problem was the need for further research in a few areas. All parties at the table had little reason to use lack of these data as a delay. Throughout the negotiations, in fact, decisions were to be made on best generally acceptable data, and resource pool funds were available to fill the gaps. Even when such data were essential, agreements were reached allowing for future change (as in altitude conversion factors).

Another criterion which may not have been met and yet may have had little adverse effect is the requirement that "stakeholders" have relatively equal power. EPA obviously had the power to write any rule it chose to, yet it could be brought back to court by NRDC if the rule were not strict enough or taken to court by the stove industry if it were too strict (or the rule might also be disapproved by OMB). It has been suggested that the woodstove industry, through the Wood Heating Alliance (WHA), was overpowered. Yet

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[15] EPA used authority granted under CAA Section 114 to request information from woodstove manufacturers regarding production costs and sales.

throughout the negotiations they bargained from the position of expertise in the industry. While they could not offer a preponderance of overwhelming data (as might some industries), the negotiation process presumes "in good faith" that such tactics are not used. It is not clear that the WHA was in an unfair position.

What is also not clear, however, is whether or not the controlling WHA members might benefit from a stricter standard to the exclusion of the perhaps underrepresented small manufacturers and the unrepresented very small (less than 200/yr.) manufacturers (see chapter 10). One criterion for successful negotiation requires that a "stakeholder" not have to compromise on issues fundamental to his/her existence. Another requires that all interests be sufficiently organized to participate in the negotiation. Yet, EPA assumed from the outset that a large number of small manufacturers would go out of business. A pertinent question is how less strict a standard would be required to less impact the small manufacturer and at what cost to the environment (and at what cost to equity if small manufacturers were excluded). This question was not to be explicitly addressed in the negotiations, yet it is not clear that a different agreement would have been reached if it had been, barring an affirmative action program for cottage industry. At any rate, all "stakeholders" had the opportunity to be heard by, if not seated on, the committee.

CHAPTER VII

THE RULEMAKING: PRE-NEGOTIATION STATUS

By September 1985, EPA analysts already had a fairly good picture of what form RWC emission control was to take. EPA contractor Radian, Inc. had already completed a detailed literature review and RWC issue paper, and most of the major potential "stakeholders" had been aware of RWC emission control developments for some time. EPA was committed to a "fast track" approach as a result of the pending court settlement with New York State and NRDC. The Wood Heating Alliance (WHA) had been involved with the EPA in the NRDC POM case and in fact both NRDC attorney David Doniger and WHA attorney David Menotti had independently proposed a negotiated regulation. Both to convince itself of reg-neg viability and to get the ball rolling, EPA held a pre-negotiation meeting of proposed "stakeholders" in September 1985 to identify the issues and discuss what EPA felt could and could not be negotiated. Attending were representatives from EPA, Oregon DEQ, Colorado Air Pollution Control, a large woodstove manufacturer, NRDC, WHA with counsel, and EPA negotiation consultant Philip Harter.

During this meeting it was agreed that representatives from testing labs, catalytic combustor manufacturers, and

the Consumer Federation of America should be contacted to represent groups concerned with consumer costs and indoor air pollution. Mr. Doniger suggested that OMB be represented and Mr. Harter said that they normally would be present as an observer but not as a committee member. (As agreement would be by consensus, OMB ultimately would have veto power anyway.) It was later agreed that attendees at the public meetings would be allowed to offer comments although the conferees would be fixed.

The attendees represented various groups with varying concerns. It is of interest to reflect on how a negotiation committee represents an array of overlapping interests. It is clearly not the case that RWC emission control was simply a matter of industry versus the environmentalists with the EPA in the middle. The various decision factors (and other concerns not listed but brought out during the negotiations) obviously had different importance (or weights) for each of the participants (see Table 16). The issues to be negotiated in general dealt with the specifics of the standard and compliance, but it is important that each participant know how each issue relates to his/her position on the underlying factors.

EPA proposed that several items were probably not negotiable. These included:

1. The schedule - a January 1987 proposal date and a January 1988 promulgation date.
2. The regulated pollutant - only particulate matter

(PM) would be regulated since the pertinent control technology also reduces CO and POM.

3. Liability - those liable for compliance; e.g. manufacturer, retailer and/or consumer would be determined according to EPA enforcement priorities.
4. Enforcement and legal requirements - EPA would determine procedures for audit and enforcement.
5. The standard would be based on best demonstrated technology (BDT).

Both industry and environmentalist groups preferred to include the enforcement, certification or accreditation procedures and the liability issue in the discussion.

The January 1987 proposal date was actually the critical date since it required that an agreement be reached per the allowed Advisory Committee Charter timetable. EPA also required a near final draft to be ready for a National Air Pollution Control Techniques Advisory Committee (NAPCTAC) meeting scheduled for September 1986. Since the July 1988 promulgation date was mandated by the out of court NRDC agreement, this date was reasonably subject to negotiation. The regulated pollutant assumption was not to be challenged by any of the participants (see discussion on p. 41). PM was the only pollutant with an adequate data base on which to base a standard. The liability and enforcement assumptions were due to "internal EPA legal and enforcement strategies" and did not in fact

limit debate through the negotiations. The committee was to play a major role in determining auditing procedures and, as it turned out, an alternative certification process.

EPA also listed a limited number of issues believed to be pertinent to reaching a settlement. These included the following:

1. Sampling methods - MM5, OM7 or ASTM and their equivalances.[16]
2. Gas flow measurement - dilution tunnel or Oregon DEQ.
3. Wood loading - density, arrangement and fuel type - and their effect on test ranking.
4. Burn rate - what burn rate profile is appropriate, and how the standard should reflect this.
5. Altitude effects - how should compliance testing account for altitude.
6. Affected facility definition - what is the technical definition of the affected wood burning appliance.
7. Applicability date - what is the appropriate schedule for compliance, regarding manufacture and retail sales.

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[16] MM5 - Modified Method five was developed by EPA to accurately measure both particulate matter and gaseous phase aeromatic emissions from wood smoke.
OM7 - Oregon Method seven was developed by Oregon Department of Environmental Quality. It is a simplified version of MM5 and was used to establish Oregon's standard.
ASTM - American Society of Testing and Materials initiated this procedure which collects only particulates or emissions adsorbed onto particulates. It is therefore cheaper to install and easier to operate than the other two methods.

8. Best demonstrated technology - how is BDT defined for woodstoves.
9. Format of standard - in what units should the standard be expressed (g/hr, g/kg wood burned or ug/J heat produced - see page 107).
10. Numerical level of standard - how should BDT be represented in a standard.
11. Certification - what are appropriate procedures for certifying woodstoves.
12. Labeling - permanent or temporary, what information.
13. Catalyst replacement - how to best encourage or require catalyst replacement.

Since many of these issues involved unresolved technical questions, EPA was to prepare a series of staff reports to summarize the available knowledge and EPA's position where applicable. A tentative schedule was offered to coordinate testing research and summary paper generation (see Table 17). This was a schedule to which EPA felt it would have to adhere whether or not it would proceed with a negotiated regulation. In fact there would be little slack available since the actual negotiations did not start until March 1986.

The participants in the September meeting agreed that the woodstove industry is comprised of many small businesses which may be adversely affected by an NSPS. EPA had been unable to obtain substantive economic data on the woodstove

Table 17

SCHEDULE OF EPA ACTIVITIES

- SAMPLING METHODS - Dec. 1985
- GAS FLOW MEASUREMENT - Dec. 1985
- WOOD LOADING - Dec. 1985
- BURN RATE - Nov. 1985
- ALTITUDE EFFECTS - Nov. 1985
- AFFECTED FACILITY DEFINITION - Jan. 1986
- APPLICABILITY DATE - Nov. 1985
- BEST DEMONSTRATED TECHNOLOGY - Spring 1985
  - Non-catalyst modifications paper - Nov. 1985
  - Comparison testing - Dec. 1985
  - Catalyst paper - Dec. 1985
  - Follow-up emission testing - Winter
  - Catalyst testing - Spring 1986
- FORMAT OF STANDARD - Oct. 1985
- NUMERICAL LEVEL OF STANDARD - Summer 1986
- CERTIFICATION - Dec. 1985
  - Who test analysis - Sept. 1985
  - Small business impact mitigation analysis - Oct. 1985
  - Sampling methods and procedures - Dec. 1985
- LABELING - Sept. 1985
- CATALYST REPLACEMENT - Spring 1986
  - Catalyst replacement analysis - Oct. 1985
  - Public Education analysis - Nov. 1985
  - Catalyst paper - Dec. 1985
  - Catalyst longevity testing - Spring 1986

industry due to the lengthy and cumbersome OMB survey approval process. Although WHA offered to assist in data gathering, EPA eventually had to secure OMB approval (necessary to send out 10 or more questionnaires) to send out the "Section 114" economic information survey (authorized under CAA Section 114). The information gleaned from this survey was to prove relevant but perhaps not essential in developing the standards exclusion procedure for small producers. The Section 114 data was however essential for the economic analysis required by the Regulatory Flexibility Act (Reg-Flex) and Executive Order 12291. Thus the lack of this imformation was a significant delaying factor in getting negotiations off the ground. By the time OMB gave approval for the survey in February 1986, EPA had already made the commitment to proceed with reg-neg.

CHAPTER VIII

THE NEGOTIATIONS

PROCEDURAL DISCUSSION

The first session of a negotiation is perhaps unique in that the mood of the entire process can be set by what is said or implied. As recommended by the various proponents of mediation, the first reg-neg committee meeting commenced with the setting of organizational and resource pool protocols. EPA had already prepared a draft protocol which was basically endorsed by the committee. Its provisions included the following:

- Any substantially affected party may be represented.
- Decision making would be by consensus, interim work groups would address recommendations for specific issues.
- A facilitator would be available if an impasse were declared by any party.
- All participants must negotiate "in good faith."

In discussion, the committee also agreed that proposals would be distributed in advance whenever possible.

Several members felt that part of the $32,500 available in a resource pool shoud be used to defray travel and other expenses. Particularly, the Consumer Foundation of

America (CFA) said that they could not participate unless the committee gave them a grant to support their time and independent research. CFA director Steve Brobeck urged EPA to "reconsider its policy of not compensating participants" (letter to Bob Ajax-U.S. EPA March 17 1986). He added that "no other group on the committee directly represented the consumer interests." In fact, the CFA was to play an instrumental role in the labeling and warranty decisions.

A tentative reg-neg agenda was established at a February 12 organizational meeting (see Table 18). The issues to be discussed at the first session were appropriately not intended to be resolved at that meeting. While all the technical considerations cannot be adequately addressed in this paper,[17] the positions of various groups in the committee on pertinent issues will be briefly described in order to present a sense of how the negotiations advanced. These issues will be lettered here in the order that they arose in the negotiations. Table 20 (p. 132) summarizes the actual discussion and resolution timetable by issue.

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[17]Technical Reports and Issue Papers are filed in the Wood Smoke Docket and are available from U.S. EPA, OAQPS, RTP, NC, 27711.

Table 18

TENTATIVE REGULATORY NEGOTIATION SCHEDULE
WOODSTOVES NEW SOURCE PERFORMANCE STANDARD

1st MEETING	
FORMAT OF STANDARD	March 20-21
WOOD LOAD PROCEDURE	March 20-21
BURN RATE	March 20-21
ALTITUDE EFFECTS	March 20-21
PRE-NEGOTIATING TRAINING SESSION	March 21
2nd MEETING	
LABELING	April 17-18
AFFECTED FACILITY	April 17-18
APPLICABILITY DATE	April 17-18
ECONOMIC MODEL OVERVIEW	April 17-18
3rd MEETING	
TEST METHODS (Sampling train, Gas flow)	May 19-20
CERTIFICATION/ACCREDITATION PROCEDURES	May 19-20
4th MEETING	
CATALYST REPLACEMENT	June 11-12
SELECTION OF BDT	June 11-12
LEVEL OF STANDARD	June 11-12
5th MEETING	
WRAP-UP	July 16-17

THE FIRST SESSION

A. Format of the Standard: Emissions can be measured as a function of the time elapsed (hr), the amount of wood burned (kg), or the amount of heat produced (Joules or BTU). There are several assumptions implicit in these. The use of ug/J best relates the amount of emissions per unit heat needed (by definition) but requires more expensive and not always accurate heat measurement (or in essence, efficiency testing). The underlying question was how well heat efficiency correlated with emission efficiency. The choice of units (g/hr, g/kg or ug/J) thus relates mathematically to other issues as well : stove efficiency (Joules/kg wood burned), burn rate (kg/hour); fuel type (Joules/kg); and heat requirements or weather weighting (Joules/hr). The EPA favored g/kg because this format would not require efficiency testing but would correlate well with ug/J (which would encourage the development of more heat efficient stoves). Another related issue is labeling, since the consumer will theoretically tend to buy the stove with the best heat efficiency (BTU/kg). Oregon and Colorado representatives favored a g/hr format because this best reflected air shed emission reduction strategy. WHA opposed a g/hr format because it would favor small stoves. (This bias would be lessened by an appropriate burn rate weighting scheme.) WHA adamantly opposed a ug/J format because of additional efficiency testing expense.

B. Burn Rate: Users burn their stoves under a variety of conditions and stoves perform differently at different burn rates. At issue was what scheme or formula best approximated real conditions on a nationwide basis. Oregon had already determined a formula for their program. WHA questioned the universal applicability of their system. They felt nationwide heat requirements (burn rates) should be higher. On the other hand, EPA and state representatives thought a lower minimum burn rate would be necessary since users could easily decrease the burn rate themselves by the addition of a stove-pipe damper. This was a "loophole" in the Oregon method. It was generally agreed that the federal standard would be a weighted average of several appropriate burn rates subject to a maximum constraint or "cap." Oregon wanted burn rate expressed in BTU (or Joules)/hr. while WHA advocated kg/hr. By whatever format, determination of the specific burn rates and the appropriate burn rate weights was postponed awaiting the results of empirical testing in progress.

C. Altitude: Like mobile sources, woodstoves emit differently at higher altitudes (due to lower air pressures). Most of the data developed by Oregon for its RWC program was generated by low altitude laboratories. They allowed for a conversion factor of 2:1 for stoves tested at higher altitudes. More recent data indicated that catalyst and non-catalyst stoves were affected differently and often

unpredictably by pressure changes. It was generally agreed that there were insufficient data to properly characterize the altitude (i.e., air pressure) effect. WHA was very opposed to a dual standard (as with automobiles) since a single standard was an important factor in bringing WHA to the negotiating table.

D. Woodload: At issue here was the appropriate fuel spacing to be used for testing. WHA favored the ASTM load while EPA and Oregon favored the OM7 load (see footnote 16). The real questions were what best approximated real world conditions, what had the best data base, and what difference it made. EPA concluded that there was no evidence to indicate that the Oregon loading was inappropriate.

COMMENTS ON THE FIRST SESSION

With the exception of the ubiquitous question of efficiency testing, the issues discussed in the first session involved technical questions of how to best approximate the real world, how to best reduce real emissions and how to best avoid circumvention and "gamesmanship." All parties were in basic accord with these principles. Progress was made on issues which involved technical questions. The efficiency testing issue was perhaps more of a policy question. It did not improve the mood of the forum. However, since it necessarily related to the format of the standard which was essential to define at the outset, efficiency was an unavoidable issue.

There were three different individuals directly representing EPA at the first few meetings: the negotiator, an "executive secretary," and a "facilitator." Additionally, the neutral "convenor" was hired by EPA. According to standard usage of terms in the literature, the actual "facilitating" was done not by EPA, but appropriately by the neutral contractor. The distinction may have been confusing to some participants.

THE SECOND SESSION

E. Compliance Date: This was the main substantive issue of the second reg-neg meeting. According to WHA it may well have been their most important issue. The major concerns were the manufacturers' need for dead time to conduct research and development and to retool; their need to deplete unsold uncomplying inventories; EPA's need for lead time to accredit test labs; and the need to avoid a testing "logjam." Related issues were "grandfathering" of Oregon and/or Colorado certified stoves, and the question of extensions or exemptions. EPA's position was that compliance by at least the largest manufacturers would be required within two years (from the anticipated July 1986 reg-neg agreement date) in order to protect the environment. WHA was not willing to state its position before the level of the standard, method of testing and the certification procedures were specified. Both Oregon and WHA supported a "grandfather" proposal, but NRDC felt that the federal

standard should be more strict than the Oregon standard and that "grandfathering" was therefore inappropriate.

F. Labeling and Consumer Education: Considerable time was spent in the second (and later) meetings discussing what would be required on stove labels. Temporary labels were considered first. CFA felt that stove heat efficiency was the "most controversial stove attribute" and favored its inclusion on labels (or a default value if efficiency and emissions were shown to correlate). This would aid consumers in stove choice. WHA felt that EPA should not get involved in what it considered to be a market issue. Oregon emphasized that total emissions would decrease if efficiency were increased. NRDC felt that a default (i.e. derived from emission tests) efficiency would be acceptable if it were slightly lower than average. This would encourage voluntary efficiency testing. WHA agreed in principle to the default approach.

Permanent label requirements were addressed next. EPA felt that date of manufacture was necessary on a permanent label for enforcement purposes and for the staggered compliance (exemption) proposal. WHA opined that this would be an unnecessary expense. CFA preferred that consumer data be confined to the temporary label except that a catalyst or non-catalyst designation should be on the permanent label.

G. Affected Facility: There was no essential disagreement on Shelton Research's definition of an affected facility which basically excluded fireplaces and very large wood

fired boilers and furnaces. Further refinement of the definition followed in later sessions.

COMMENTS ON THE SECOND SESSION

A considerable portion of the second session was spent discussing the EPA's Economic Analysis Branch (EAB) econometric simulation model. This model was developed to summarize EPA's knowledge of the woodstove industry and the effects of regulation on sales and user preferences. It was essentially a demand simulation model but could also be used to predict emission levels as a function of different control regulations. EAB data came primarily from the EPA Section 114 survey responses (see footnote 15). Although many of the model's assumptions were questioned by the group, the model conclusions were minimal: that a compliance delay for small manufacturers would not greatly increase emissions, that an increase in average stove efficiency (presumably through consumer education labels) would lead to substantial societal cost savings, and that the cost of such labels would be an insignificant factor in stove sales.

Considerable time was also spent on the presentation of a WHA-contracted user survey which disputed some of the EAB assumptions. EPA agreed to run their model using other various assumptions suggested by the parties. It is questionable that the EAB model was instructive in the negotiations. The concept of multi-factor econometrics is

at best tenuous when the data are not complete. It can also be viewed as an exclusionary tool if all parties do not have equal resources. If any of the EAB model's conclusions were truly contentious, it is unlikely that the model would have added to their credibility at the negotiating table.

THE THIRD SESSION

H. Test Method: The choice of test method involved the technical and policy questions of what is being measured, how accurately is it measured and how often has it been measured (i.e. data base). At the outset, EPA chose to regulate particulate matter only, but as a surrogate for POM and CO regulation as well. From the limited data, however, POM emission does not correlate well with PM emission. Physically, less POM is generated at low burn rates. The effect on specific POM species mutagenicity is even more unclear. There was no good data base for effective POM reduction: most stove development data measured particulate matter only.

Of the three test method candidates, EPA's MM5, Oregon's OM7, and ASTM, OM7 had the largest data base (see footnote 16). These data were to be the basis for best demonstrated technology (BDT) determination. EPA had to insist, therefore, that OM7 would be the reference method if the standard were to be logically consistent. WHA's preference for the ASTM method stemmed from the fact that most manufacturers will require their own test facilities

for R & D. The ASTM dilution tunnel method is considerably cheaper and simpler to operate (less intra-lab variability). Inter-lab variability was not well known however. Requiring the OM7 method would also increase the "logjam" potential, a fundamental WHA concern, since there would presumably be fewer OM7 test laboratories.

I. BDT Selection: Since determinization of BDT would in effect determine the standard, EPA representatives chose to present their methodology for determining BDT at the third meeting even though selection of BDT was not scheduled until the fourth session. Essentially the method selected, from 26 of the Oregon-1986 certified stoves, a set of stoves which had similar and superior emission profiles. An algorithm developed to predict lifetime emissions showed that catalyst BDT and non-catalyst BDT had similar net emissions.

Oregon was in agreement with the methodology. NRDC felt that the set of Oregon-1988 certified stoves would be more appropriate in determining a long-term federal standard. WHA felt that the Oregon-86 group choice was in fact too selective since Oregon allowed data selectivity. (This would not be a problem for a "well-controlled" stove with a fairly level emission profile - a criterion for the BDT set selection).

J. Certification Procedures: Discussion of certification procedures was initiated via EPA's presentation of an

example rule. Most of the discussion involved WHA assertion that manufacturers needed to be present during testing and EPA's insistence that they not be. WHA favored certifying manufacturer-owned labs but the majority felt this was inadvisable. It was generally resolved that certification would be good for five years and that EPA could re-test under an audit program. All parties agreed that a plan to assume adequate test labs was desireable.

COMMENTS ON THE THIRD SESSION

Test Method was perhaps the main substantive issue of the third session. The real issue was: How well did ASTM and OM7 correlate? If they did, then WHA should have no problem with OM7 as a reference method. If they did not, then there would be considerable R & D misdirection if manufacturers were to use ASTM. This was a technical question and involved test lab reliability. This suggests that appropriate use of an audit system could resolve the issue: to assure EPA that an ASTM tested stove was indeed compliant and to assure WHA that an ASTM developed stove would not "flunk" an audit.

Several issues illustrate the use of interim committees to save valuable session time. Considerable time was again spent in debating the assumptions of the EAB model. EPA aptly proposed that interested parties could meet separately to discuss the assumptions and their implications in the model results. Less time was spent on what may be a more

important issue: labeling.

The labeling/public information sub-committee reported on its progress with little debate. This sub-committee's recommendations were to be essentially followed by the reg-neg committee but many details were left unresolved until the last session.

A lengthy discussion of the EPA-prepared example rule involved several issues. As well as bringing to light possible procedural problems, the example rule also served as a focal point. In a multi-issue negotiation it is easy to lose track of the real objective, writing a final rule. The language use in the rule itself must evolve as the negotiations progress, but an earlier presentation of an example rule probably would have been premature: participants might have thought it was being "rammed down their throats." As some observers felt that EPA had already made up its mind, this timing was sensitive.

At the third meeting it was agreed to schedule a sixth meeting in August to more fully resolve the issues. All members realized, however, that EPA's schedule would allow no further meetings.

THE FOURTH SESSION

K. Catalyst Replacement: This was the last essentially singular issue brought up. The issue was intrinsically data-driven but related to the issue of a catalyst-non-catalyst lifetime equivalence factor (LEF) (see pp. 71-72),

to warranties, and to certification procedures. A low LEF would imply a lower non-cat standard, a benefit to catalyst producers, but could oblige a longer warranty which they were against since most catalyst failures were shown to be related to stove design. NRDC favored certification lab inspection to eliminate stove designs most likely to fail prematurely, but WHA felt that EPA could not impose what would amount to a design standard. EPA, Oregon, NRDC and CFA all expressed the need to assure catalyst integrity, but WHA and the catalyst manufacturers felt this was a market issue. The specifics of the warranty were deferred until the July meeting.

L. Level of the Standard: This final issue, essentially the "bottom line" of the NSPS, was first specifically introduced at the fourth meeting. Three proposals were presented by the three major factions, EPA, WHA, and an "environmental coalition" of NRDC, state representatives and CFA. Fundamentally, these were "package deals" and were based on assumptions relating to each party's perception of the various anticipated group agreements on other issues. The proposals thus were a starting point for bargaining. They are presented in Table 19. The major differences were the timetable and the numerical standard. It is clear that there was significant distance between the two "extremes" -

Table 19

COMPARISON OF REGULATORY APPROACHES

	EPA	WHA	NRDC et al.
Compliance Date	7/1/88 7/1/90	1/1/89 (one phase only)	7/1/88 7/1/90
Emission Limits	- Same as Oregon '88 limits (4 g/hr cat, 9 g/hr non-cat)	4.3 g/hr cat stoves, 12.7 g/hr non-cats (Nebraska weighting)	3 g/hr (88) 2 g/hr (90) for cats; 7 g/hr (88) 5 g/hr (90) for non-cats
	- Composite and cap based on BDT for '90		(Oregon weighting)
Low Heat Output Testing	< 20,000 Btu/hr for 1988		<12,000 Btu/hr for 1988
	< 12,000 Btu for 1990		
Exemptions	All mfrs could produce up to 2000 noncertified stoves during 7/88 to 7/89	small mfrs (<2000/yr) exempted for 2 years (until 1/91)	small mfrs (<2000/yr) exempted for 1 year (until 7/89)
Other	EPA - Close Oregon loopholes - First year enforcement confined to mfrs to give retailers time to work off inventory - Separate cat and noncat limits	WHA - Reasonable safeguards in reg to assure that mfrs are not victims of logjam - Grandfather Oregon stoves	NRDC, et al - Strong audit program including "challenge" provision

WHA and NRDC et al. - especially on emission limits.[18] The WHA was looking for final controls two to three times less restrictive than those of NRDC et al. with compliance coming half a year later than EPA's target date for phase I compliance.

The WHA proposal also included a non-specific EPA performance requirement and a "safety valve kickout" for good faith effort. The purpose of these was to avoid failure to get a certificate for reasons beyond a manufacturer's control. NRDC and Colorado representatives pointed out that due to production schedules, the WHA 1/1/89 compliance date was equivalent to a 7/1/89 date (Colorado had been criticized by the industry for its standard's mid-winter date).

After NRDC et al. had introduced their proposal, the OMB representative arose to criticize its stringency. He then proposed a novel scheme wherein the standards would be determined by actual sales weighted BDT in such a way that there would be market incentives to produce a cleaner burning stove. This is discussed in more detail in chapter 10.

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[18]The differences are somehwat obscured by the use of two weighting systems. On the average, WHA's 4.3 g/hr (Nebraska weighted) is equivalent to EPA's 4 g/hr (Oregon weighted) but the equivalence relationship is emission profile specific - i.e. catalyst and non-catalyst stove equivalences are quite different.

COMMENTS ON THE FOURTH SESSION

Almost all the aforementioned issues were discussed at the fourth reg-neg meeting. In general, the committee was firming up agreement on the more technical and definitional issues. EPA was amenable to Oregon's g/hr format, but the issue of fixing burn rate to BTUs/hr or g/hr was left unresolved. The CONEG weather weighting data had convinced WHA of the efficacy, in principle, of the Oregon weighting system. Data better establishing the equivalences of these various measurement systems were becoming available through the several test lab representatives on the committee. However, some relationships such as the ASTM-OM7 correlation or a workable altitude correction factor were still not well defined.

It was becoming increasingly clear that WHA's primary concerns, beyond the numerical level of the standard, involved the rule's impact on R & D and production scheduling. They were afraid that a poorly run certification test could have crucial scheduling consequences. The procedural concerns of EPA and the "environment coalition," however, required guarantees of a fair and accurate test. They tentatively agreed to WHA's demand that manufacturers be allowed to be present during the test if an audit program could be assured by a surcharge (eg. one free test for every five) to be used to re-test stoves on a random basis (NRDC specifically didn't want the

audit program tied to the vagaries of the EPA budget). This was not inconsistent with WHA's desire to avoid circumvention possibilities.

WHA's concern for an adequate "logjam" remedy, and the need for an appeal procedure, also related to manufacturing schedule concerns. Manufacturers were particularly uneasy due to the annual cycle of their business - a few months' delay in certification could affect an entire year's production line. Thus the details of the certification process were inherent in WHA's position on the numerical value of the standards themselves.

The fact that EPA had not defined BDT for 1990 in its proposal allowed room for bargaining, yet WHA had also left room for bargaining. Its one-phase-only proposal was probably flexible since, in fact, one purpose of EPA's two-tiered standard was to ease the burden on the industry. WHA's proposed standard was basically equivalent to Oregon 1988 for catalyst stoves. The difference in their non-cat position would depend on how non-cat BDT and the catalyst degradation rate would be determined; both were essentially technical questions. Since the issue was proper interpretation of the data, there were no immovable positions.

The WHA position on exemptions was pliant as well. They in fact later proposed a percentage-based exemption which would obviously favor large producers but would not

benefit the cottage industry (less than 200 stoves/yr) at all. WHA then amended that to 2000 stoves for all manufacturers after an evening caucus. Possibly those present were not firm on this either. As long as they could guarantee that uncertified old inventory could be sold, equity actually would require that the 2000 exemption not be extended to all manufacturers because it would benefit only those for whom a 2000 stove uncertified line would be advantageous. Thus, in its attempt to moderate the impact on the industry, EPA's 2000 stove exemption offer (although for one year only), may not have been advantageous to the indusy as a whole. Indeed, the "environmentalists'" proposal (2000 exemption for small manufacturers only) was the ultimate consensus.

THE FIFTH SESSION

All substantive issues had been presented and discussed by the beginning of the fifth session. At the end of the fourth session convenor Philip Harter had asked that all parties send him a summary of proposals to circulate before the fifth session. He also had met with the parties separately during the interim. Parties were thus prepared to reach agreement on most substantive issues, yet major areas were still unresolved.

A key proposal was introduced by WHA - an alternative certification for logjam relief. This was conceptually agreed upon by the committee, subject to checks and balances

to address the concerns of other parties. As proposed by WHA, EPA would make monthly assessments of test lab backlogs and related EPA administrative capacity. An alternative certification procedure would be triggered when a logjam exceeding six months existed. This certification would be based on manufacturer's R & D test data in lieu of test lab data and would give temporary certification until 12/31/88, or at most until the stove was laboratory tested. If the stove subsequently failed a laboratory test, production must halt within 24 hours if it is a "major flunk." The definition of major or minor flunk was not resolved.

Substantial agreement was also reached on most of the other issues listed above. There were, of course, details and points of discussion not reported in this analysis. For convenience, the issues are summarized here in the order listed previously:

A. Format - g/hr - resolved

B. Burn rate - kg/hr. CONEG weighting, one test below 1.25 kg/hr in phase I, 1.0 kg/hr in phase II - resolved

C. Altitude - No altitude adjustment for certification purposes until data is available (Alternative certification R & D test data may be adjusted however) - essentially unresolved

D. Loading - (see test method) - resolved

E. Labeling - draft owners manual and temporary labels presented by labeling task force. Permanent label details not yet firm - unresolved

F. Affected Facility - Fireplaces and "coal only" stoves exempt. All others included

except: 1) firebox greater than 20 cubic feet 2) lowest burn rate air-fuel ratio greater than 35:1, 3) lowest burn rate greater than 5 kg/hr, and 4) appliance weight greater than 2000 kg (to exclude "high mass" stoves) resolved (WHA to define coal only) - essentially resolved

G. Test Method - OM7 the reference method. Test labs to individually show ASTM equivalence until data indicate a concrete relationship - resolved

H. BDT Selection - Essentially resolved. Non-catalyst implications not resolved - unresolved

I. Certification Procedures - Oregon approved test labs will be "grandfathered" for EPA accreditation. A task group will work out details of lab proficiency requirements. Enforcement program audit tests will use the same test method. What constitutes an audit failure and other details to be worked out by interim task force - essentially resolved

J. Catalyst Replacement - A public information program will be developed. The rule will require that catalysts be easy to examine and to replace. Stoves must have a port available for catalyst temperature sensors which will be required if and when their reliability is adequately documented. Catalysts will be warranteed for two years unconditionally but a three year physical integrity warranty had not been accepted by catalyst manufacturers - unresolved

K. Level of the Standard and Exemptions -

The following agreements were reached (based on Oregon weighting):

phase I	4 g/hr	9 g/hr
(7/88 to 7/90)	no cap	no cap

phase II	3 g/hr	7.5 g/hr
(7/90 to 7/92)	cap of 2.3 SD	cap not resolved

Since catalyst stoves generally showed a well-defined increase in emissions at higher burn rates, a cap was set at 2.3 standard deviations above the composite slope (of BDT defined stoves). Non-catalyst stoves showed more variance. (see Appendix 5 for examples.) WHA wanted a cap of 20 g/hr, NRDC et al., wanted a cap of 15 g/hr. Also unresolved was whether all manufacturers would get the 2000 stove exemption, large manufacturers be confined to exempt their smallest "line," or small manufacturer (less than 2000) exemption only (and not more than a base line previous production). unresolved

COMMENTS ON THE FIFTH SESSION

There was substantial give and take and frequent caucusing at the fifth session, which took a full two and a half days to complete. Some of the discussion became heated at times. At one point WHA suggested that they might withdraw to which EPA countered by threatening that they would write a stricter standard. The STAPPA/ALAPCO representative reminded WHA several times that over 100 areas were expected to be non-compliant due to PM10 and that several states had standards "waiting in the wings." Progress continued to be made, however.

There was again considerable discussion on the exemption specifics. WHA proposed several schemes for determining exemptions. Interestingly, WHA suggested that 2000 stove exemptions per manufacturer be marketable although they had previously disagreed with EPA's involvement in market issues. WHA claimed that they needed

a 300,000 stove "spillover" or almost all of what they had estimated as total yearly production (EPA was to use 800,000/year in the September 1986 Federal Register Notice). The Oregon representative commented that a percentage reduction had advantages for SIP predictions: it better predicted how many stoves would be non-compliant. Since one stove manufacturer had confided privately that he thought there should be no exemptions, WHA seemed to be spending considerable time on what relatively may have been a non-issue (given that an exemption for at least small - <2000 - manufacturers was already resolved).

The issue of certification procedure was also discussed at length. Principles of the logjam relief and audit programs were worked out with few major areas of contention. Details such as what constituted audit failure were left to an interim task force to work out by the last session in August.

The "environmental coalition" had presented their proposal first: a 1990 standard of 3.1 g/hr for catalysts and 6.9 g/hr for non-catalysts (based on CONEG weighting), stating that the 6.9 g/hr "should be reachable by 1990." Only after logjam relief and other issues were essentially resolved did WHA present its last level-of-standards proposal. WHA proposed essentially the Oregon 1988 standards for July 1988 and 4.1 g/hr for catalysts, 8.9 g/hr for non-catalysts for the 1990 standard (also CONEG

weighted). WHA had come a substantial distance from its original proposals (see Table 19). The final agreement was actually a compromise. It was somewhat confused by the juxtapositioning of CONEG and Oregon weighting systems. Since the conversion factor between the two is dependent on the emission/burn rate profile, the equivalences of the various proposals were perhaps obscured. Actually, NRDC et al. acquiesced on catalytic stoves (3 g/hr Oregon = 4.1 g/hr CONEG for catalyst BDT) but WHA met them more or less half way on non-catalytic stoves (7.5 g/hr Oregon = 7.5 g/hr CONEG for non-catalytic BDT).

WHA maintained its insistance on a 20 g/hr non-catalytic cap, so the non-catalytic standard essentially remained unresolved. Nonetheless, substantial "give and take" had occurred. Most observers felt that the last session should proceed smoothly with only a few details left to be resolved.

THE SIXTH SESSION

At the outset of the sixth meeting, convenor Philip Harter presented an agenda of twelve topics with yet unresolved differences. Only one of these involved the numerical level of the standard itself. The other eleven were relatively less controversial.

Four of these were basically refinements of the certification procedures. These included enforcement provisions/audit program details; logjam relief details; laboratory accredation details; and grandfathered stove

provisions. All parties had already agreed in principle to the need for these provisions. Many of the details had been worked out by interim groups to address some of the concerns expressed at the fifth meeting. For example, inter-lab reliability factor data were essential in determining what would constitute a "major flunk" in the alternate certification procedure. It was agreed that an excess of 50% would be a statistically significant violation and would trigger immediate (72 hr) certification revocation.

Three of the topics were basically technical in nature: conversion of emission limits from Oregon to CONEG weighting, correlation of test methods, and attitude adjustment. The first of these was essential to the writing of the standard and involved the determination of the most appropriate BDT population. The latter two were essentially based on how to interpret best available data.[19] It was decided that no altitude allowance would be given for regular certification purposes since high altitude labs could be pressurized to duplicate the BDT data base. Provision was made, however, for an altitude adjustment factor in grandfathered stoves, alternative certification tests, and enforcement audit tests.

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[19]Although seemingly appropriate semantically, a log-log best fit approximation factor was rejected in favor of the average ASTM-OM7 correlation determined by three test labs.

Details were also easily resolved in the labeling and affected facility issues. In labeling, it was decided that the permanent label should contain enforcement information, the temporary label should present comparative information, and the owner's manual should contain operating and maintenance information. Details of how this information would be portrayed were resolved. A default efficiency was allowed in lieu of actual standard efficiency test results. On the affected facilities issue, boilers (i.e. water heaters) and furnaces (as defined by Canadian and American safety codes) were exempted. This did not, however, preclude EPA from eventually reconsidering if data should later warrant their inclusion.

The question of catalyst warranty was finally resolved. A third year non-prorated warranty on substrate damage would be required after July 1, 1990. CFA had argued against the concept of prorated warranties from the outset as not in the consumer's best interest, being basically an assured-sales gimmick.

The two remaining topics, the one-year exemption and the non-catalyst cap specifications were the most contentious. It was finally agreed that only small manufacturers (<2000/yr) would be exempted up to a maximum of 2000 or production from July 1, 1987 to the compliance date July 1, 1988. This was resolved concurrently with the cap question.

The NRDC et al. had proposed a 7.2 g/hr standard with a 15 g/hr straight line cap for non-catalyst stoves. WHA amended its 20 g/hr cap proposal to settle on a 15 g/hr cap up to 1.5 kg/hr burn rate and 18 g/hr over 1.5 kg/hr. This accommodated the concern for the low burn rate - high emission tendency of non-catalyst stoves, but allowed more flexibility than the NRDC et al. proposal.

It was also resolved that the members appeal to EPA Administrator Lee Thomas to adequately fund the EPA involvement necessary to carry out the provisions of the agreement. Executive Secretary Chris Kirtz (Director of EPA's Regulatory Negotiation Project, assured the group that the Administrator had pledged his support if consensus were reached. The OMB representative, however, suggested that EPA might have sent someone to the negotiating table who could have guaranteed adequate EPA funding support.

COMMENTS ON THE SIXTH SESSION

Although most of the substantive issues had already been worked out, the sixth and final meeting was the most vocal. The final two issues were not resolved until late the second day. The environmental consequences of the difference between a 15 g/hr cap and a 20 g/hr cap are probably not significant since each stove must pass the user-established burn rate profile weighting. It would be an extremely rare circumstance for a user to burn exclusively in the worst burn rate of a given stove. Yet it

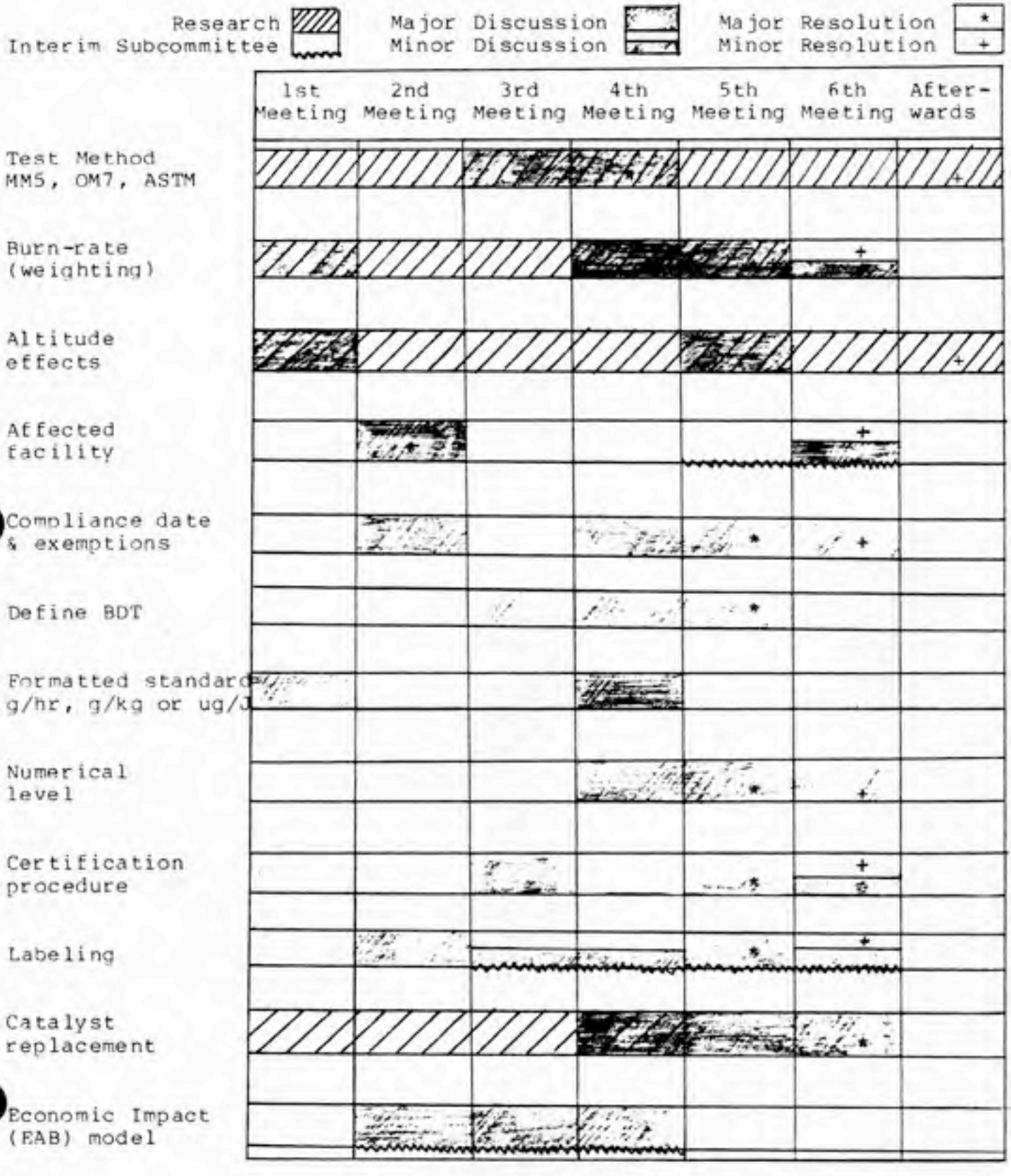
appeared at times that the entire proceedings might be jeopardized by this one sub-issue.

This last minute, face-saving posturing may be a lesson to be learned in scheduling the agenda for negotiations. If time for a sixth meeting had not been available (the EPA's scheduled NAPCTAC meeting in September precluded another reg-neg meeting if a January 1987 proposal date were to be met) it is likely that the last minute trepidations would have coincided with substantive issues. While commentors cited in chapter 5 agree that a deadline for agreement is a necessity to successful negotiation, it is apparent that too inflexible a deadline can be a detriment.

A draft copy of the latest compilation of the final agreements included in Appendix 1. It is the version submitted to the NAPCTAC meeting September 1985. Amendments may be made before official publication scheduled for January 1, 1987.

Table 20 summarizes the issues discussed in this chapter. It is clear that the major agreements occurred in the fourth and fifth sessions. The discussion above has shown how these issues were interdependent. Some of these interdependencies may not have been clear to all participants at the outset but their importance became more apparent as the negotiations progressed.

Table 20
RWC Issues Versus Negotiation Sessions



CHAPTER IX

COMMENTS ON THE ROLE OF OMB

> "When a government agency can find nothing better to do than to attempt to regulate how individual Americans burn wood in a fireplace, we have reached the point at which all reason has vanished from the government's effort and nonsense is the rule of the day"[20]

For most of the participants in the negotiations it was clear who represented whom and what their interests were. Some of these overt interests have been discussed in Chapter 6. The roles of some other participants warrant more discussion. Some have suggested that EPA was most concerned with setting any regulation relieving them of their court obligation, but the evidence indicates that EPA primarily wanted a "workable and durable" rule. For two of the participants, however, there remain questions regarding whom they represented and what their underlying interests were. Any WHA "covert agenda," or lack of such, is discussed in the next chapter. The role of OMB will be discussed here.

Partly from an attempt to coordinate government regulatory philosophy and specifically from their review of the positive benefit-cost criterion of executive order 12291,

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[20] Letter from concerned citizen to President Reagan, October 29, 1985, RWC Docket II-D.

the Office of Management and Budget has gained considerable regulatory oversight power in recent years. In effect, OMB reviews all agency decisions for reasonableness and consistency of purpose, the latter being often a subject of contention between an administration's interpretation of its electoral mandate and the agency's interpretation of its congressional mandate.

Although not listed as a participant, OMB was included in the conferee list as an "observer." Its presence had been suggested by NRDC's David Doniger in the Sept. 1984 reg-neg feasibility meeting. One commentor has observed that participation by OMB reduces the real - or perceived - potential for parties to undermine the negotiating process by making "end runs" to OMB (Perritt 1986). The point of negotiations is to get all interests likely to influence the substance of the regulation to communicate directly with each other. The participation of OMB is therefore appropriate and perhaps necessary in regulatory negotiations in general. The nature of its role is more obscure.

At times, the OMB observer seemed to be an advocate for the WHA interests and was perceived as such by some of the WHA members. One member commented that only OMB kept EPA from imposing excessive regulations; another member, however, felt that EPA's place in the negotiations was actually mid-ground between WHA and NRDC and that OMB did not really side with WHA.

The last few lines of the RWC Federal Advisory Committee Charter lead one to suspect that OMB is wary of the negotiated regulation process. At OMB's request it was stated that this approval would not imply future reg-neg approval.

The reg-neg process, by its incremental development of consensus among affected parties, can in effect limit OMB's power of blanket approval or disapproval (sometimes without comment). According to OMB statistics, almost a quarter of all rules sent to OMB for review were changed last year at the budget office's direction (Washington Post, June 30 1986).

The office has been accused of "sitting on regulations, weakening them, intimidating bureaucrats not to propose them, undermining their implementation, holding private meetings with industry and operating in secret" (Washington Post, June 30 1986). Due to congressional reaction to these complaints, OMB agreed to fuller disclosures wherein all drafts of proposed rules would be made available to the public before and after OMB's sugested changes with the reasons for them. Previously, only the published version of a rule, in which OMB's revisions could not be tracked, was available. These changes do not decrease OMB's authority but make it more accountable to its Congressional and public oversight. Accordingly, the more public nature of its role in the reg-neg process should not be substantially different from its role in more formal rule-making procedures.

Perhaps as an adjunct to its role as an advocate for regulatory relief, OMB has often suggested that market-oriented mechanisms generally be used as incentives as an alternative to more rigid agency rulemaking. The use of economic incentives for environmental protection has been a much disputed subject. There is an apparent impasse between OMB's proclivity for market solutions and EPA's intact regulatory machinery. Thomas C. Schelling has observed, "There is a discrepancy between the approach of economists to environmental protection and the approach of nearly everyone else. Prohibition and other modes of regulation are exceptions to [economists'] general presumption" (emphasis added) (Schelling 1983). Economic incentives are not in the usual EPA NSPS development process. An NSPS must, however, "take into account the cost of achieving such emission control" (CAA Section 111(a)(1)).

It is debatable that market-related incentives are less obtrusive to industry than traditional hard-and-fast rules. Mid-way through the fourth session of the negotiations, the OMB representative proposed an alternative schedule for phasing in new standards, wherein the sales-weighted average emissions of stoves meeting the initial standards (to be negotiated in the committee, but presumably to be less strict) would be used to set a subsequent new standard.[21] In effect if 50% of the stoves sold

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[21] OMB suggested every four years - the same time that the standard would ordinarily be up for review.

achieved 50% better results than the required standard in spite of their anticipated excess price, while the remaining 50% just met the standard, then the next phase standard would automatically adjust to require 25% lower emissions. Since there would thus seem little incentive to decrease emissions below the NSPS other than to put other companies not able to do better than the standard out of business, OMB additionally suggested that credits (for example in stove-grams per hour below the standard) be allowed to accrue which could then be sold, within a year, to manufacturers not able to meet the new standard. This would presumably drive up the price of the more polluting stoves. Fewer would then be sold which would again lower the resultant new sales-weighted emission average for the second term. This procedure would thus define the next best demonstrated technology (BDT). To limit the downward spiral effect a lower bound was suggested.

This procedure obviously has interest to environmentalists who might question whether regular standard review in four years would be likely to occur or otherwise if review might even loosen standards. The EPA could either object to its loss of influence four years down the road, or welcome the automatic nature of the proposal.

When WHA proposed a variation on marketable credits in the final negotiations EPA was not able to consider the use of "credits" without higher-level EPA approval. Certainly

OMB was aware of this. One manufacturer remarked that whereas EPA positions had been distributed in staff papers in advance of each session, and whereas both Oregon and WHA had sent similar notices, the OMB proposal seemed more or less "out of the blue." Such a novel concept would require considerable economic analysis by the industry in order even to form a reasonable opinion on its merits; why then did OMB wait until the fourth (and originally the last scheduled) substantive negotiation session to propose it? If the OMB were WHA's supposed advocate, and if such a proposal were to be taken seriously, industry support would be critical. Yet no advance notice of this proposal was sent to the participants.

It is perhaps regrettable that more effort could not have been given to what might have been a credible case for market incentives. Unfortunately those who propose such designs often "have not devised in sufficient detail for implementation, the schemes that their general reasoning leads them to admire and sometimes to advocate" (Thomas C. Schelling 1983).

OMB's role in these negotiations, and its position on reg-neg in general, is thus unclear. On the one hand, the committee process itself is in a sense a market test in that it reflects the interests of those affected by the regulation. A market-oriented OMB should not have major concerns with an agreement reached by a consensus which implies that each participant has determined that he/she is

better off with the regulation. On the other hand, OMB had raised several objections before approving the RWC Advisory Committee charter - namely the use of the resource pool for travel (although this use was specifically recommended by ERM-McGlennon), a lower maximum number of conferees (also against ERM-McGlennon suggestions) and finally questioning the continued use of reg-neg in general. Curiously, at one time OMB had been supportive of the process and had promised a 24-hour turn-around on any notice that was based on a consensus (Harter 1986). That policy has since been rescinded, however, and OMB appears ambivalent, although it has so far approved each consensus-based regulation. It would appear that OMB may be experiencing a "loss of turf" and yet can find no substantive grounds on which to object.

When asked about OMB's official position, their representative responded that there really was none as such, that OMB was internally pro and con. Regarding the lack of interest in the marketable credit proposal, he felt that both the NRDC and WHA were afraid of the uncertainty. OMB's main objection to the RWC reg-negs, he stated, was that the small manufacturers - "who keep the large manufacturers honest" - were underrepresented. Moreover, if this had been a full-time-schedule regulation, he felt that EPA would have devised a prototype design or plan which small manufacturers could "plug into" to stay in business. He did not mention,

however, that this could be interpreted as a design standard which the woodstove industry did not want.

Although it may be true that small manufacturers were underrepresented, it is not clear that this was by design (see Chapter 10). Early in the negotiations EPA had proposed a 2,000 stove exemption for the first year primarily to give small manufacturers more time. Also, EPA had ascertained that there would be certifiable designs available on the market that a small manufacturer could buy, although this issue was not raised in negotiations. While OMB's suspicions that WHA did not represent the small manufacturer's interests may have been affirmed at times - such as when WHA proposed that the one year exemption be set at a percentage of the baseline production for each manufacturer - the fact that WHA rescinded that position after caucus suggests that the small manufacturer interests did indeed have a voice that was heard.

OMB's contention that the small manufacturers keep the large ones honest may actually be somewhat inaccurate in the RWC industry. Many "small" manufacturers are actually subdivisions of larger firms which saw excess profits available in woodstoves in the 1970s. Many of these companies are not interested in design development, and some would probably have expired in the unregulated market. The truly small one-man shop operation will indeed have a problem, but many others will survive. In fact, according to a Missoula, Montana test lab owner, it is the small

manufacturers who will be the innovators in emission control. They are already coming up with new designs while many large manufacturers (though not all) tend to "stick with what works" with little incentive to innovate.

CHAPTER X

COMMENTS ON INTERVIEWS WITH WOODSTOVE MANUFACTURERS

In order to investigate questions regarding the woodstove industry's participation in the regulatory negotiations, individual stove manufacturers were interviewed. Names of stove manufacturers in North Carolina and the Shenandoah Valley of Virginia were obtained from the EPA's Section 114 questionnaire mailing list and from Wood 'n' Energy's 1985 and 1986 Buyer's Guide issues. It was felt that this method would accurately sample a cross-section of the industry. In total, twenty-two manufacturers were contacted.

The most important information gained from these interviews was that the wood smoke industry is very diverse, both in plant size and in perception of RWC regulation and how it will affect them. It was, in fact, apparent that size was not the only criterion influencing NSPS impact. One large manufacturer had not yet produced a certified stove, although another "medium" (about 2500 stoves/yr) already sold 60% catalyst models. The observation that smaller manufacturers may be more innovative was supported in that

two small companies had plans on line to produce pellet-burning stoves.

Another aspect of the diversity was apparent in the "medium" manufacturers. For some of these, woodstoves were a side line which had become less profitable. One said they probably would get out of the business. Others were more positive and felt that regulation would help the industry improve its product. Small manufacturers also showed this dichotomy, with some being unaware of the pending regulations and what they would mean, and others already starting to plan for them.

To those manufacturers familiar with the reg-neg developments, the main criticism was that the test conditions didn't duplicate real use and that stoves would be too small and wouldn't burn overnight. (The low burn rate requirements would mollify this complaint.) Many did not feel RWC emissions were a problem in the Southeast. One manufacturer feared an emergence of a black market for uncertified stoves. He explained that the many inferior stoves that had proliferated during the stove boom were finally disappearing from the market but would return. This concern was not explicitly addressed in the negotiations. It would be unfortunate if EPA's Enforcement and Compliance Division allowed complying manufacturers to be hurt by an illegal market. In fact, the EAB model predicted that low-heat-requirement areas would tend to buy the more polluting stoves.

Only about half the manufacturers contacted were WHA members. One member telt that most WHA members joined only for the WHA's yearly woodstove trade show - that only the large manufacturers were on the WHA Board of Directors. A WHA poll, however, had shown that most manufacturers favored national regulations of some type and few complaints were heard on WHA's involvement. Nonetheless, WHA membership dues are proportional to the members' production, so WHA is financially tied to large manufacturers. Also there is an unknown number of very small manufacturers not contacted who were not on the EPA or Wood 'n' Energy lists: WHA has essentially no financial incentive to represent them. The relevant issue is: do they have basically different interests? The case of one small (less than 300/yr) non-WHA manufacturer indicates this may not be the case. He already sells 10% catalyst stoves because of consumer demand and has been very impressed with their performance. He did not feel regulations would hurt his business.

The interviews indicated that the NSPS will definitely hurt some and probably help others. Essentially, the less efficient and less innovative manufacturers will be hurt. It is not clear that large manufacturers will definitely benefit although the impact on the small manufacturers contacted will no doubt be greater. A NSPS will clearly change the rules of the game.

CHAPTER XI

SUMMARY AND CONCLUSIONS

Although the concept of negotiation is not new, it has only recently been applied to new areas as an alternative to more traditional adversarial decision processes.[22] Indeed, the 1980's may turn out to be the decade of mediation. Although each negotiation is unique, several observations can be made that apply to regulatory negotiation in general.

The most obvious conclusions one might draw from the RWC reg-neg process are that the issues most important to one participant were not necessarily the issues most important to the others and that subsequently the mediation process is not a "linear" one. Mediation is <u>not</u> simply a process wherein two opposing sides start from their respective positions and then meet at some compromised midpoint determined by the relative strengths of the opposing sides. It is rather a process much like multi-objective optimization whereby each of perhaps many parties uses the negotiation forum to identify the aspects of various issues that are most important to itself. Through

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[22]Even such traditional adversaries as car owners and auto mechanics are utilizing mediation procedures to resolve disputes in several locally sponsored programs (NIASE Newsletter, August 1986).

the negotiation process these aspects are weighed against the various concerns of the other parties. If the appropriate facts are adequately communicated it is conceivably possible to minimize the net adverse affects of a regulation while maximizing the net desired effects - each party having concurrently a different measurement of the relative value of each effect. Another related conclusion is that this allows parties to discuss the issues and their implications at a timely manner - before decisions are made and before the regulatory machinery is set in motion. This is a concept which is deficient in the traditional rulemaking process.

The RWC regulatory negotiations particularly illustrated these precepts. The "environmental coalition" for example had within itself many different priorities. Moreover, it is evident that EPA's priorities coincided with neither the WHA nor NRDC et al. The standard that EPA might have written by its traditional procedures would very likely have been quite different, particularly in areas such as consumer interests or fire safety where it had little expertise or agenda. Also EPA may not have otherwise been as aware of WHA's scheduling concerns. The timely consideration of WHA's logjam proposals may actually have allowed EPA to set a stricter standard than if these had been addressed after a standard had been set. It is difficult to suppose that all of the considerations

expressed in the reg-neg meetings would have arisen in the traditional notice and comment process.

The RWC emission reg-neg process thus demonstrated that negotiation can be not only a viable alternative but even a superior alternative to traditional rulemaking. All of the participants apparently were satisfied that the agreement reached had adequately addressed their concerns, or at least had bettered their "Best Alternative to Negotiated Agreement" (BATNA) (see Perritt 1986 p. 404). NRDC got a standard which reasonably assured that RWC-generated POM would be minimized, at least for new stoves. It would seem unreasonable to regulate existing stoves nationwide.[23] The state air pollution agencies got a standard in terms easily related to emission predictions that they might use on their PM10 attainment plans.[24] WHA got a much stricter standard than they would have written themselves but their major scheduling concerns were met. Most importantly, they had surpassed their "BATNA" - which was their presumption upon entering negotiations (see chapter 6). EPA got a standard - on an accelerated schedule - which met its POM obligations and would help areas meet the pending PM10 standards as

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[23] In fact NRDC had agreed that they would not press EPA to decrease POM emissions from existing woodstoves if EPA would set new stove regulations on an accelerated schedule. Reg-neg met this schedule.

[24] EPA's refusal to authorize an altitude factor will however lessen the credit that high altitude states will be allowed to use for RWC emission reduction predictions.

well. Moreover, the standard would be less susceptible to court challenges since all parties affected presumably had been involved in the decision.

It is not altogether clear that a strict formula can be drawn up to predict success. Many of the tenets set forth in chapter 5 applied, but some did not. It is apparent that there should be enough flexibility to adapt these guidelines to each case. For example, commentors on mediation techniques (see chapter 5) agree that the first sessions should be reserved for less contentious issues, communication of appropriate facts and for defining areas of concern. The scheduling of issues is an important consideration. Subsequent sessions should focus the issues and pinpoint the areas of contention - then positions can be taken and compromises made. In the RWC reg-negs, however, it was necessary to introduce the relatively contentious issue of efficiency testing in the first session. It was important that each of the participants knew where the others stood on the issues. Nonetheless, contentious issues are probably best avoided at the initial negotiations.

Related to the importance of this judicious use of issue scheduling at the beginning, the RWC reg-negs also demonstrated a need for flexibility at the end - without violating the "imposed time constraint" tenet. Although most substantive issues were resolved within the five sessions originally scheduled, a sixth session proved to be

essential to an agreement. If this flexibility had not been available, it is likely that an agreement might not have been reached. The NAPCTAC meeting scheduled for September 1986 put a limit on this flexibility. Whether by design or by chance, the RWC time constraints appear to have been optimal.

There are, however, several EPA procedural decisions which seem to have been problematic - both having to do with the "equal power" tenet expressed in chapter 5. One is the applicability of the EPA's Economic Analysis Branch (EAB) model or more generally, the use of programmed decision analysis (see pp. 111-112). The EAB model was in existence primarily because of EO12291 and the Regulatory Flexibility Act requirements but it was also introduced as a rationale for EPA's position on some of the issues. Debate on its assumptions consumed much valuable time for little apparent product. Programmable decision analysis is a powerful tool, but it presumes not only that the data assumptions are correct but also that the model itself is correct (see footnote 14). The assumptions can be debated but the model itself is a "black box" except to econometric experts. As participants became better acquainted with this model, they were more accepting of it yet considerable relatively unproductive time was spent discussing the model's assumptions.

An additional lesson might be the impropriety of the EPA "triumvirate" present at the first few meetings. It is

not evident that EPA required such a show of strength - it already had the power to write a rule if the negotiations had broken down and it is not clear that the extra presence helped the process. In other circumstances, for example with an industry more experienced with regulatory maneuvering, this may not be the case. This is not the kind of criterion easily expressed in a list of "rules for successful negotiations." It also emphasizes the continuous assessment and flexibility necessary during the process to assure the likelihood of success. Nonetheless, the importance of individual personalities, and of course the skills of the negotiators, cannot be overemphasized. This is an attribute which may be impossible to characterize in a list of rules.

The RWC regulatory negotiations serve as a demonstration of how mediation can be applied to a technical problem where the interests involved are diverse. It is likely that other candidates exist for regulatory negotiation and negotiated rulemaking in particular. As EPA and the regulated community gather experience with negotiation, they will be able not only to better choose "successes" a priori but also to more advantageously set procedures.

A FINAL NOTE

Missoula, Montana health director Elaine Bild has recently reported, "...We are not seeing a huge decrease in

air pollution but we know that less wood is burned in the city" (Wood 'n' Energy, October 1986 p. 11). In Denver, however, the Metro Air Council will still initiate mandatory no-burn days. The same issue of Wood 'n' Energy also had a feature article entitled, "An Inside Look at Coal Stoves." It will be interesting to see if "coal only" stove sales increase when the standards take effect - and more interesting to see what is being burned in them. The reg-neg agreements specifically do not prevent EPA from later regulating non-affected facilities so any notable increase in coal burning or evidence of circumvention via the "coal only" exemption could initiate further EPA action.

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APPENDIX 1

RWC EMISSION REGULATORY NEGOTIATION

LEGAL COMMITTEE DRAFT

U.S. EPA, OCTOBER 1986

PART 60 [AMENDED]

It is proposed that 40 CFR Part 60 be amended as follows:

1. The authority citation for Part 60 continues to read as follows:

Authority: Secs. 101, 111, 114, 301(a), Clean Air Act as amended (42 U.S.C. 7401, 7411, 7414, 7601).

2. By adding a new Subpart AAA consisting of §§ 60.530 through 60.539 as follows:

Subpart AAA - Standards of Performance for Residential Wood Heaters

Subpart AAA - Standards of Performance for Residential Wood Heaters

§ 60.530 Applicability and designation of affected facility.

(a) The affected facility to which the provisions of this subpart apply is each wood heater manufactured on or after July 1, 1988 or sold at retail on or after July 1, 1990. The provisions of this subpart do not apply to wood heaters constructed prior to July 1, 1988, that are or have been owned by a noncommercial owner for his personal use.

(b) Each affected facility shall comply with the applicable emission limits in § 60.532 unless exempted under paragraph (c), (d), (e), (f) or (g) of this section.

(c)(1) Within a model line, an affected facility manufactured prior to July 1, 1990 is exempt from the requirements in § 60.532 and shall be certified by the Administrator if that model line has been issued a valid certificate of compliance by the Oregon Department of Environmental Quality prior to January 1, 1988, and meets the Oregon 1988 standards for particulate matter emissions, provided that

(A) The manufacturer requests the exemption in writing from the Administrator, and certifies that the information used in obtaining Oregon certification satisfied applicable requirements of the Oregon law,

(B) The certification test included at least one test run at a burn rate of less than 1.25 kg/hr; and

(C) No changes in components that may affect emissions have been made to the model line that would require recertification under § 60.533(k).

(2) Affected facilities exempted under this paragraph may not be sold at retail after July 1, 1992.

(3) Any certificate issued under this paragraph shall be modified to reflect any modifications in Oregon certification approved by the Oregon Department of Environmental Quality prior to January 1, 1988. The manufacturer shall notify the Administrator of any such modifications within thirty days of their approval by the Oregon Department of Environmental Quality.

(4) Upon denying a certificate under this subsection the Administrator shall give written notice to the manufacturer involved setting forth the basis for his determination.

(d) An affected facility is exempt from the applicable emission limits of § 60.532, provided that (1) it was manufactured between July 1, 1988 and June 30, 1989; (2) the manufacturer was a manufacturer of wood heaters as of January 1, 1987, and manufactured fewer than 2,000 wood heaters between July 1, 1987 and June 30, 1988; (3) the manufacturer manufactures no more uncertified wood heaters between July 1, 1988 and June 30, 1989 than it manufactured between July 1, 1987 and June 30, 1988; and (4) the affected facility is sold at retail before July 1, 1991.

(e) Affected facilities manufactured in the U.S. for export are exempt from the applicable emission limits of § 60.532.

(f) A wood heater used for research and development purposes that is never offered for sale or sold is exempt from the applicable emission limits of § 60.532. No more than 50 wood heaters manufactured per model line may be exempted for this purpose.

(g) A coal-only heater is exempt from the applicable emission limits of § 60.532.

(h) The following are not affected facilities and are not subject to this subpart:

(1) Wood heaters modified or reconstructed as defined in § 60.14 and § 60.15 of Subpart A.

(2) Open masonry fireplaces constructed on site.

(3) Boilers, and

(4) Furnaces.

§ 60.531 Definitions.

As used in this subpart, all terms not defined herein shall have the meaning given them in the Act and Subpart A of this part.

"At retail" means the sale by a commercial owner of a wood heater to the ultimate purchaser.

"Boiler" means a solid fuel burning appliance used primarily for heating spaces other than the space where the appliance is

located, by the distribution through pipes of a gas or fluid heated in the appliance.

"Coal-only heater" means an enclosed, coal-burning appliance capable of and intended for space heating, domestic water heating, or indoor cooking, which has all of the following characteristics:

(a) an opening for loading coal which is located near the top or front of the appliance;

(b) an opening for emptying ash which is located near the bottom or the side of the appliance;

(c) an opening which admits air only up and through the fuel bed;

(d) a grate or other similar device for shaking or disturbing the fuel bed;

(e) installation instructions which state that the use of wood in the stove except for coal ignition purposes is prohibited by law; and

(f) the model was safety tested by a nationally recognized safety-testing laboratory using coal only, except for coal ignition purposes.

"Commercial owner" means any person who owns a wood heater in the course of the manufacture, importation, distribution, or sale of the wood heater.

"Furnace" means a solid fuel burning appliance used primarily for heating spaces other than the space where the appliance is located, by the distribution through ducts of air heated in the appliance.

"Manufactured" means completed and ready for shipment (whether or not packaged).

"Manufacturer" means any person who constructs or imports a wood heater.

"Model line" means all wood heaters offered for sale by a single manufacturer that are similar in all material respects.

"Representative affected facility" means an individual wood heater that is similar in all material respects to other wood heaters within the model line it represents.

"Sale" means the transfer of ownership, except that transfer of control shall not constitute a sale for purposes of § 60.530(f).

"Similar in all material respects" means that the construction materials, exhaust and inlet air system, and other design features are within the allowed tolerances for components identified in § 60.533(k).

"Wood heater" means an enclosed, woodburning appliance capable of and intended for space heating, domestic water heating, or indoor cooking, that meets all of the following criteria:

(a) An air-to-fuel ratio in the combustion chamber averaging less than 35-to-1 as determined by the test procedure prescribed in § 60.534;

(b) A usable firebox volume of less than 20 cubic feet;

(c) A minimum burn rate less than 5 kg/hr; and

(d) A maximum weight of 800 kg.

§ 60.532 Standards for particulate matter.

Unless exempted under § 60.530, each affected facility

(a) Manufactured on or after July 1, 1988, or sold at retail on or after July 1, 1990, shall comply with the following particulate matter emission limitations as determined by the test methods and procedures in § 60.534:

(1) An affected facility equipped with a catalytic combustor shall not discharge into the atmosphere any gases which contain particulate matter in excess of a weighted average of 5.5 g/hr.

(2) An affected facility not equipped with a catalytic combustor shall not discharge into the atmosphere any gases which contain particulate matter in excess of a weighted average of 8.5 g/hr.

(b) Manufactured on or after July 1, 1990, or sold at retail on or after July 1, 1992, shall comply with the following particulate matter emission limitations as determined by the test methods and procedures in § 60.534:

(1) An affected facility equipped with a catalytic combustor shall not discharge into the atmosphere any gases which contain particulate matter in excess of a weighted average of 4.1 g/hr. Particulate emissions during any test run at any burn rate that is required to be used in the weighted average shall exceed the value calculated for "C" calculated using the following equation:

(A) At burn rates less than or equal to 2.82 kg/hr,

C = 3.55 g/kg x BR + 4.98 g/hr, where

BR = burn rate in kg/hr

(B) At burn rates greater than 2.82 kg/hr, C = 15 g/hr.

(2) An affected facility not equipped with a catalytic combustor shall not discharge into the atmosphere any gases which contain particulate matter in excess of a weighted average of 7.5 g/hr. Particulate emissions shall not exceed 15 g/hr during any test run at a burn rate less than or equal to 1.5 kg/hr that is required to be used in the weighted average, and particulate emissions shall not exceed 18 g/hr during any test run at a burn rate less than or equal to 1.5 kg/hr that is required to be used in the weighted average.

§ 60.533 Compliance and certification.

(a) For each model line, compliance with applicable emission limits may be determined based on testing of representative affected facilities within the model line.

(b) Any manufacturer of an affected facility may apply to the Administrator for a certificate of compliance for a model line. The application shall be in writing to: Stationary Source Compliance Division (EN-341), U.S. EPA, 401 M Street, S.W., Washington, D.C., 20460, Attention: Wood Heater Program. The application must be signed by the manufacturer, or an authorized representative, and shall contain the following:

(1) The model name and/or design number;

(2) A photograph of the tested unit;

(3) Engineering drawings and specifications of components that may affect emissions (including specifications for each component listed in paragraph (k)(2) of this section). Manufacturers shall identify tolerances of components of the tested unit listed in paragraph (k)(2) of this section that are different than those specified in that paragraph, and demonstrate that such tolerances may not reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission standards.

(4) All documentation pertaining to a valid certification test, including the complete test report and raw data sheets; laboratory technician notes, calculations, and test results for all test runs.

(5) For catalytic wood heaters, a copy of the catalytic combustor warranty;

(6) A statement that the manufacturer will conduct a Quality Assurance Program for the model line which satisfies the requirements of paragraph (o) of this section;

(7) A statement that the test unit was sealed by the laboratory after the completion of certification testing; and

(8) A statement that the manufacturer will notify the accredited laboratory if the application for certification is granted, within thirty days of receipt of notification from EPA.

(c) If the affected facility is a catalytic wood heater, the warranty for the catalytic combustor shall include the

replacement of the combustor and any prior replacement combustor without charge to the consumer for:

(1) 2 years from the date the consumer purchased the heater for any defects in workmanship or materials that prevent the combustor from functioning when installed and operated properly in the wood heater, and

(2) 3 years from the date the consumer purchased the heater for thermal crumbling or disintegration of the substrate material for heaters manufactured after July 1, 1990.

(d) The manufacturer of an affected facility equipped with a catalytic combustor shall provide for a means to allow the owner readily to gain access to the catalyst for inspection or replacement purposes.

(e)(1) The Administrator shall issue a certificate of compliance for a model line if he determines, based on all information submitted by the applicant and any other relevant information available to him, that:

(A) a valid certification test has demonstrated that the wood heater representative of the model line complies with the applicable particulate emission standard in § 60.532,

(B) any tolerances for components listed in paragraph (k)(2) that are different than those specified in that paragraph may not reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission standard; and

(C) the requirements of paragraphs (b), (c), (d), and (m) of this Section have been met.

(2) For the period between proposal of this subpart through June 30, 1988, an applicant may elect to have his application determined under the requirements of subpart AAA proposed on (date of proposal).

(3) Upon denying certification under this paragraph, the Administrator shall give written notice to the manufacturer setting forth the basis for his determination.

(f) To be valid, a certification test must be

(1) Announced to the Administrator at least 30 days prior to such testing, pursuant to § 60.534;

(2) Conducted by a testing laboratory accredited by the Administrator pursuant to § 60.535;

(3) Conducted on a wood heater similar in all material respects to other wood heaters of the model line which is to be certified; and

(4) Conducted in accordance with the test methods and procedures specified in § 60.534.

(h)(1)(i) The Administrator on a monthly basis between April 1, 1987 and July 1, 1990 shall determine whether an undue certification delay exists, pursuant to subsection (2) of this paragraph. Such determinations shall be made on or about the 20th day of the month.

(ii) Any failure of the Administrator to make a required determination under subsection (i) by the 30th day of any month shall constitute a determination that an undue certification delay exists.

(iii) Any determination under subsection (i) or (ii) shall remain in effect until superceded by a subsequent determination; except that a determination under subsection (ii) shall remain in effect for at least thirty (30) days.

(iv) The Administrator shall mail notice of all determinations under subsection (i) or (ii) to all persons who have requested in writing to receive them.

(2) An undue certification delay exists when the sum of the average testing lead time and the certification lead time is greater than six months.

(i) The average testing lead time shall be determined from the information submitted by accredited laboratories pursuant to § 60.538(h). The average testing lead time is the simple average of lead times reported under § 60.538(h)(2) for the previous month.

(ii) The certification lead time shall be an estimate, as of the date of the determination, of the time likely to be required to determine whether to issue a certificate of compliance for a complete application received on that date. This estimate shall be based on such factors as past experience, the number of applications to be processed, and the resources available for processing.

(3) (i) While any determination under subsection (1) that an undue certification delay exists is in effect, a manufacturer may submit an application for alternative certification.

(ii) An application for alternative certification shall be in writing to: Stationary Source Compliance Division (EN-341),

U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460, Attention: Wood Heater Program. The application must be signed by the manufacturer, or an authorized representative, and contain the following:

(A) The documentation required under subsections (b)(1) - (6) of this section, except that, in applying subsection (b)(4), subsections (f)(1) - (3) shall not apply;

(B) Evidence of compliance with paragraphs (c), (d) and (m) of this section;

(C) A statement that a representative affected facility for the model line in question has been tested in accordance with § 60.534(a), and meets applicable emission standards in § 60.532. Such testing may be conducted in any laboratory of the manufacturer's choice;

(D) A statement identifying the month which will be the end of the manufacturer's production year for that model;

(E) Evidence that the manufacturer has scheduled with an accredited laboratory the testing required for full certification under this subpart at the earliest feasible date;

(F) Evidence that the manufacturer has notified the laboratory that he intends to apply for alternative certification; and

(G) A commitment to report the results of the tesfing required for full certification to the Administrator.

(iii) Test results not obtained under pressurized conditions may be adjusted for altitude according to the following formula:

$\frac{E}{AAF}$, where

E = measured emissions in g/hr at ALT_L

AAF = altitude adjustment factor where,

$AAF = \frac{ALT_L - 300}{6600} + 1.0$

ALT_L = altitude above mean sea level of laboratory in feet

(4)(i) Submission of an application for alternative certification pursuant to subparagraph (3) automatically renders a model line certified thirty days after receipt of the application for alternative certification by the Administrator, unless alternative certification is sooner denied, on the basis that the application is not complete, or that the test results do not show compliance with the applicable emission standards in § 60.532. Except as provided in subsections (4)(ii) through (4)(iv) of this paragraph, alternative certification shall expire on the earlier of (A) the completion of the manufacturer's production year during which the Administrator takes action under paragraph (e) of this section on an application for certification; or (B) twelve months after such action.

(ii) If, in any certification tests performed pursuant to subparagraph (3)(ii)(E) and (F), the affected facility exceeds the applicable emission standards in section 60.532 by greater than a 50% deviation, alternative certification pursuant to this paragraph shall expire 72 hours after the manufacturer receives notification from the laboratory of the test results, which satisfies subsection (4)(v).

(iii) If, in any certification test performed under subparagraph (3)(ii), the affected facility exceeds the applicable emission standards in section 60.532, alternative certification pursuant to this paragraph shall expire 72 hours after the manufacturer receives notification satisfying subsection (4)(v) from the laboratory of the test results, if such notification is received within 100 days of the date on which the manufacturer scheduled the certification test.

(iv) Alternative certification shall expire 72 hours after the manufacturer receives notification from the Administrator that the manufacturer has failed to meet a scheduled commitment for certification testing.

(v) Any notification under subsection (4)(ii) or (4)(iii) of this paragraph shall include a copy of a preliminary test report from the accredited laboratory. The accredited laboratory shall provide a preliminary test report to the manufacturer and to the Administrator within ten days of the completion of testing, if a wood heater exceeds the applicable emission standard in § 60.532 in certification testing.

(i) An applicant for certification may apply for a waiver of the requirement to submit the results of a certification test pursuant to subsection (l)(4), if the wood heaters of the model line are similar in all material respects to another model line that has already been issued a certificate of compliance. A manufacturer that seeks a waiver of certification testing must identify the model line that has been certified and must submit a copy of an agreement with the owner of the design permitting the applicant to produce wood heaters of that design.

(j)(1) Unless sooner revoked by the Administrator, a certificate of compliance shall be valid:

(A) To and including June 30, 1990, for a model line certified as meeting emissions standards in § 60.532(a); and

(B) For five years from the date of issuance, for a model line certified as meeting emission standards in § 60.532(b).

(2) Upon application for renewal of certification by the manufacturer, the Administrator may waive the requirement for certification testing upon determining that the model line continues to meet the requirements for certification in paragraph (e) of this section, or that a waiver of certification is otherwise appropriate.

(3) Upon waiving certification testing under this paragraph, the Administrator shall give written notice to the manufacturer setting forth the basis for his determination.

(k)(1) A model line must be recertified whenever any change is made in the design submitted pursuant to § 60.533(b)(4) that is presumed to affect the particulate emission rate for that

model line. The Administrator may waive this requirement upon written request by the manufacturer, if he determines that the change may not reasonably be anticipated to cause wood heaters in the model line to exceed the applicable emission standards. The grant of such a waiver does not relieve the manufacturer of any compliance obligations under this subpart.

(2) Any change in the indicated characteristics of the following components is presumed to affect particulate emissions if that change exceeds a tolerance specified in engineering drawings submitted with the certification application, or, if no tolerance is so specified, ±1/4 inch for any linear dimension and ±5 percent for dimensions relating to air introduction systems:

(A) Firebox: dimensions;

(B) Air introduction systems: cross-sectional area of restrictive air inlets, outlets, and location and method of control;

(C) Baffles: dimensions and locations;

(D) Refractory/insulation: dimensions, and location;

(E) Catalyst: dimensions, and location;

(F) Catalyst bypass mechanism: dimensions and location;

(G) Flue gas exit: location and dimensions; and

(H) Door and catalyst bypass gaskets: dimensions and fit.

(3) Any change in the materials used for the following components is presumed to affect emissions:

(A) Refractory/insulation;

(B) Door and catalyst bypass gaskets;

(C) Firebox.

(4) A change in the make, model, or composition of a catalyst is presumed to affect emissions, unless the change has been approved in advance by the Administrator.

(1)(1) The Administrator may revoke a certificate of compliance if he determines that the wood heaters being produced in that model line do not comply with the requirements of this section or section 60.532. Such a determination shall be based on all available evidence, including:

(A) Test data from a re-testing of the original unit on which the certification test was conducted;

(B) A finding that the certification test was not valid;

(C) A finding that the labeling of the wood heater does not comply with the requirements of § 60.536 or § 60.537.

(D) Failure by the manufacturer to comply with reporting and recordkeeping requirements under § 60.538;

(E) Physical examination showing that a significant percentage of production units inspected are not similar in all material respects to the representative affected facility submitted for testing; or

(F) Failure of the manufacturer to conduct a quality assurance program in conformity with § 60.533(o).

(2) Revocation of certification under this subsection shall not take effect until the manufacturer concerned has been given written notice by the Administrator setting forth the basis for the proposed determination and an opportunity for to request a hearing under § 60.539.

(3) Determination to revoke certification based upon audit testing shall be made only in accordance with paragraph (p) of this section.

(m) A catalyst-equipped wood heater shall be equipped with a permanent provision to accommodate a commercially available temperature sensor which can monitor combustor gas stream temperatures within or immediately downstream (within 1 inch) of the combustor surface.

(n) Any manufacturer of an affected facility that is subject under § 60.530(b) to the applicable emission limits of this Subpart and does not belong to a model line certified under this section shall cause that facility to be tested in an accredited laboratory in accordance with subparagraphs (f)(1), (f)(2), and (f)(4), of this section before it leaves the manufacturers hands and shall report the results to the Administrator.

(o)(1) For each certified model line, the manufacturer shall conduct a quality assurance program satisfying the requirements of this paragraph.

(2) Except as provided in subsection (5) of this paragraph, the manufacturer or his authorized representative shall inspect at least one out of every 150 units produced within a model line, to determine that the wood heater is within applicable tolerances for all components that affect emissions as listed in paragraph (k)(2) of this section.

(3) (A) Except as provided in subsection (5) of this paragraph, the manufacturer or his authorized representative

shall conduct emissions tests on affected facilities produced within a model line certified under § 60.533(e) or § 60.533(h), on the following schedule:

If weighted average certification test results were:	If yearly production per model is:	
	< or = 2500	>2500
70% or less of std.	When directed by EPA, not to exceed once every 10,000 stoves	Every 10,000 stoves or triennially (whichever is more frequent)
Within 30% of std.	Every 5,000 stoves	Every 5,000 stoves or annually (whichever is more frequent)

(B) Emission tests shall be conducted in conformity with § 60.534(a), using the same test method and procedure used to obtain certification. The manufacturer shall notify EPA by U.S. mail that an emissions test required pursuant to this paragraph will be conducted within one week of the mailing of the notification.

(4) The manufacturer shall take remedial measures, as appropriate, when inspection or testing pursuant to this paragraph indicate that affected facilities within the model line are not within applicable tolerances or do not comply with applicable emission limits. Manufacturers shall record the problem identified, the extent of the problem, the remedial measures taken, and the effect of those measures as projected by the manufacturer or determined by any additional testing.

(5)(A) If two consecutive passing tests are conducted under either subsection (2) or (3) of this paragraph, the required frequency of testing under the applicable subsection(s) shall be modified as follows: skip every other required test.

(B) If five consecutive passing tests are conducted under the modified schedule provided for in subsection (A), the required frequency of testing under the applicable subsection shall be further modified as follows: skip three consecutive required tests after each required test that is conducted.

(C) Testing shall resume on the frequency specified in the subsection (2) or (3), as applicable, if a test failure results in any test conducted under a modified schedule.

(5) If emissions tests under this paragraph are conducted at an altitude different from the altitude at which certification tests were conducted, and are not obtained under pressured conditions, the results shall be adjusted for altitude in accordance with subsection (h)(3)(iv).

(p)(1)(A) The Administrator shall after July 1, 1990 select for random compliance audit testing certified wood heater model lines that have not already been subject to a random compliance audit under this paragraph. The Administrator shall use a procedure that insures that the selection process is random.

(B) The Administrator may, by means of a neutral selection scheme, select model lines certified under § 60.533(e) or § 60.533(h) for selective enforcement audit testing under this paragraph. Prior to July 1, 1990, the Administrator shall only select a model line for a selective enforcement audit on the basis of information indicating that affected facilities within the model line may exceed the applicable emission standard in § 60.532.

(2) The Administrator shall randomly select for audit testing five production wood heaters from each model line

selected under paragraph (1). These wood heaters shall be selected from completed units ready for shipment from the manufacturer's facility (whether or not the units are in a package or container). The wood heaters shall be sealed upon selection and remain sealed until they are tested or until the audit is completed. The wood heaters shall be numbered in the order that they were selected.

(3)(A) The Administrator shall test the first of the five wood heaters selected under subsection (2) in a laboratory accredited under § 60.535 that is selected pursuant to subsection (4).

(B)(i) In the case of a random compliance audit, the expense of the test shall be paid from the escrow account established by the laboratory under § 60.535(b)(3), unless the funds in that account are insufficient, and the laboratory is not obligated pursuant to § 60.535(b)(3) to perform an audit test for the Administrator. The escrow agent shall pay for such a test from the laboratory's escrow account, on the instructions of the Administrator. The maximum amount that the laboratory may charge the Administrator for performance of an audit test shall be determined by the following formula:

$$A = \frac{B}{D/5 - PA}, \text{ where}$$

B = the balance in the laboratory's escrow account;

D = the total number of deposits into that account under § 60.535(b)(4), and

PA = the number of previous audits charged against that escrow account

(ii) The Administrator may direct the escrow agent to utilize funds in the escrow account of a laboratory, to pay for a random compliance audit at another accredited laboratory, only if the laboratory which established the escrow account is no longer accredited, or is no longer in the business of certification testing of wood heaters under this subpart. In such a case, the charge for the test shall be determined by the Administrator, taking into account the average charge for random compliance audit tests during the preceeding year.

(C) The test shall be conducted using the same test method and procedure used to obtain certification. If the test is performed in a pressure vessel, air pressure in the pressure vessel shall be maintained within 1% of the average of the barometric pressures recorded for each individual test run required to be used under § 60.534(a) to calculate the weighted average emissions rate. The Administrator shall notify the manufacturer at least one week prior to any test under this paragraph, and allow the manufacturer and/or his authorized representatives to observe the test.

(4)(A) Except as provided in this subsection, the Administrator may select any accredited laboratory for random compliance audit testing.

(B)(i) Until the Administrator has amended this subpart to include a determination of the interlaboratory precision of the test method and procedure used to obtain certification, the Administrator shall select the accredited laboratory which performed the test used to obtain certification. If another

laboratory is selected pursuant to this subsection, and the overall precision of the test method and procedure is $\geq$ 1 gram per hour at laboratories below 1000 feet elevation (or equivalent), the interlaboratory component of the imprecision shall be added to the applicable emissions standard for the purposes of this paragraph.

(ii) With respect to each test method and procedure set out in § 60.534(a)(2), the Administrator shall, by July 1, 1990, publish a decision, after notice of an opportunity for comment, which either (I) amends this subpart to include a determination of the overall imprecision of the method and procedure, and the interlaboratory component thereof; or (II) sets forth a determination that the available data are insufficient to determine the overall imprecision of the method and procedure, and the interlaboratory component thereof.

(C) The Administrator shall not select an accredited laboratory that is located at an elevation more than 500 feet higher than the elevation of the laboratory which performed the test used to obtain certification, unless the audit test is performed in a pressure vessel.

(D) The Administrator shall not select a laboratory which is not obligated pursuant to § 60.535(b)(B) to perform a random compliance audit for the Administrator, unless there is no accredited laboratory which is so obligated.

(5)(A) If a wood heater tested under paragraph (3) exceeds the applicable weighted average emissions standard by more than a 50% deviation, the Administrator shall so notify the manufacturer

that certification for that model line is suspended effective 72 hours from the receipt of the notice, unless the suspension notice is withdrawn by the Adminstrator. The suspension shall remain in effect until withdrawn by the Administrator, or 30 days from its effective date (if a revocation notice under subsection (B) is not issued within that period), or the date of final agency action on revocation, whichever occurs earlier.

(B)(i) If a wood heater tested under paragraph (3) exceeds the applicable weighted average emissions standard, the Administrator shall notify the manufacturer that certification is revoked for that model line.

(ii) A revocation notice under subsection (i) shall become final and effective sixty days after receipt by the manufacturer, unless it is withdrawn, a hearing is requested under Section 60.539, or the deadline for requesting a hearing is extended.

(iii) The Administrator may extend the deadline for requesting a hearing for up to 60 days, for good cause.

(iv) A manufacturer may extend the deadline for requesting a hearing for up to six months, by agreeing to a voluntary suspension of certification.

(C) Any notification under subsection (5)(A) or (5)(B) of this paragraph shall include a copy of a preliminary test report from the accredited laboratory. The accredited laboratory shall provide a preliminary test report to the Administrator within ten days of the completion of testing, if a wood heater exceeds the applicable emission standard in § 60.532. The laboratory shall

provide the Administrator and the manufacturer, within thirty days of the completion of testing, all documentation pertaining to the test, including the complete test report and raw data sheets, laboratory technician notes, and test results for all test runs.

(D) Upon receiving notification of a test failure under section (B), the manufacturer may submit some or all of the remaining four wood heaters selected under subsection (3) for testing at his own expense, in the order they were selected by the Administrator, at the laboratory that performed the emissions test for the Administrator.

(E) Whether or not the manufacturer proceeds under subsection (D), the manufacturer may submit any relevant information to the Administrator, including any other test data generated pursuant to this subpart. The manufacturer shall pay the expense of any testing performed for him.

(F) The Administrator shall withdraw any notice issued under subsection (B) if tests under subparagraph (D) show either

(i) that all four wood heaters tested for the manufacturer met the applicable weighted average emissions standard; or

(ii) that the second and third wood heaters selected met the applicable weighted average emissions standard and the average of all three weighted averages (including the original audit test) was below the applicable weighted average emissions standard.

(G) The Administrator may withdraw any proposed revocation, if the Administrator finds that an audit test failure has been

rebutted by information submitted by the manufacturer under subsection D and/or subsection E or by any other relevant information available to him.

(H) Any withdrawal of a proposed revocation shall be accompanied by a document setting forth its basis.

§ 60.534 Test Methods and procedures.

Test methods and procedures in Appendix A of this part, except as provided under § 60.8(b), are used to determine compliance with the standards and requirements for certification under §§ 60.532 and 60.533 as follows:

(a)(1) Method 28 - Procedure for the Certification of Emissions Control Capabilities for Residential Wood Heaters - is used to establish the certification test conditions and the particulate matter weighted averages.

(2) Emission concentrations may be measured with either:

(A) Method 5G - Determination of Particulate Matter Emissions from Residential Wood Heaters Using a Dilution Tunnel Sampling Location, or

(B) Method 5H - Determination of Particulate Matter Emissions from Residential Wood Heaters Using a Stack Location.

(b) Method 29 - Determination of Air-to-Fuel Ratio for Residential Wood Heaters - is used to determine that a wood combustion unit qualifies under the definition of wood heater in § 60.531(a).

(c) Appendix G - Determination of Thermal Efficiency for Residential Wood Heaters - is used as an optional procedure in establishing the overall thermal efficiency of wood heaters.

(d) The manufacturer of an affected facility shall provide the Administrator at least 30 days prior notice of any certification test to afford the Administrator the opportunity to have an observer present. Notification of schedule changes in certification testing may be made by telephone provided that such notification is documented in writing by the manufacturer. The Administrator shall accept notifications under this paragraph on and after October 16, 1986.

§ 60.535 Laboratory accreditation.

(a)(1) A laboratory may apply to the Administrator to be accredited to conduct wood heater certification tests pursuant to § 60.533. The application shall be in writing to: Emissions Measurement Branch (MD-13), U.S. EPA, Research Triangle Park, North Carolina 27711, (Attn: Wood Heater Laboratory Accreditation).

(2) For the period between proposal of this subpart through June 30, 1988, the criteria for accreditation shall be the requirements of Subpart AAA proposed on (date of proposal).

(3) Upon denying accreditation under this section the Administrator shall give written notice to the laboratory setting forth the basis for his determination.

(b) In order for a test laboratory to qualify for accreditation the laboratory must:

(1) Be accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for wood heater emissions testing, pursuant to 15 CFR 7;

(2) Have no conflict of interest or stand to gain any financial benefit from the outcome of certification testing conducted pursuant to § 60.533;

(3) Agree to perform one audit test at the Administrator's direction for each five tests performed by the laboratory on the basis of which model lines are certified under § 60.533(e) to meet the emission standards in § 60.532(b).

(4) Establish, prior to the effective date of accreditation, an interest-bearing escrow account at a federally insured financial institution in trust for the benefit of the Administrator. The laboratory shall agree that within 30 days after certification is granted under § 60.533(e) to meet the emission standards in § 60.532(b) on the basis of a test conducted at the laboratory, the laboratory will deposit into the escrow account an amount equal to 20 percent of the charge to the manufacturer for the certification test (calculated without regard to any amount surcharged to cover the escrow fund deposit).

(5) Demonstrate proficiency to achieve reproducible results with at least one test method and procedure in § 60.534(a), by:

(A) performing a test consisting of at least nine test runs on a wood heater identified by the Administrator;

(B) providing the Administrator at least 30 days prior notice of the test to afford the Administrator the opportunity to have an observer present; and

(C) submitting to the Administrator all documentation pertaining to the test, including a complete test report and raw data sheets, laboratory technicial notes, and test results for all test runs;

(6) Be located in the continental United States; and

(7) Agree to participate, no more frequently than annually, in a proficiency testing program conducted by the Administrator.

(c) Laboratories accredited by the State of Oregon prior to January 1, 1988, may be accredited by the Administrator without regard to the requirements in paragraph (b)(1) of this section, provided that the laboratory requests the accreditation in writing and, in addition to other applicable requirements, certifies under penalty of law that the information used in obtaining Oregon certification satisfied applicable requirements of Oregon law.

(d) If on or after February 1, 1987, NVLAP accreditation is unavailable, a laboratory may be provisionally accredited by the Administrator, without regard to he requirements of paragraph (b)(1) of this section, provided that the laboratory requests provisional accreditation in writing, and establishes, in addition to other applicable requirements, that:

(1) laboratory personnel have a total of one year of relevant experience in particulate measurement, including at

least three months experience in measuring particulate emissions from wood heaters;

(2) the laboratory has the equipment necessary to perform testing in accordance with at least one test method and procedure in § 60.534(a); and

(3) laboratory personnel have experience in test management and laboratory management.

(e)(1) The Administrator may revoke laboratory accreditation if he determines that the laboratory

(A) No longer satisfies the requirements for accreditation in paragraph (b), (c) or (d);

(B) Does not follow required procedures or practices, as shown in a laboratory audit;

(C) Had falsified data or otherwise misrepresented emission data;

(D) Failed to apply funds to an escrow account as required in paragraph (b)(4) of this section or used funds from that account for purposes other than audit testing directed by the Administrator; or

(E) Failed to participate in a proficiency testing program, in accordance with its commitment under paragraph (b) of this section.

(2) Revocation of accreditation under this subsection shall not take effect until the laboratory concerned has been given written notice by the Administrator setting forth the basis for the proposed determination and an opportunity for a hearing under § 60.539.

(f) Unless sooner revoked, a certificate of accreditation shall be valid:

(1) for five years from the date of issuance, for certificates issued under paragraph (b) of this section;

(2) until July 1, 1990, for certificates issued under paragraph (c) of this section;

(3) for one year from the date of issuance, for certificates issued under paragraph (d) of this section.

(g) An accredited laboratory shall seal any wood heater on which it performed certification tests, upon completion of certification testing.

§ 60.536 Permanent Label, Temporary Label, and Owner's Manual.

(a)(1) Each affected facility manufactured on or after July 1, 1988 or offered for sale at retail on or after July 1, 1990 shall have a permanent label affixed to it that meets the requirements of this section.

(2) Except for units subject to § 60.530(e), (f), or (g), the permanent label shall contain the following information:

(A) Month and year of manufacture,

(B) Model name or number, and

(C) Serial number.

(3) The permanent label shall:

(A) Be affixed in a readily visible or accessible location;

(B) Be at least 3-1/2 inches long and 2 inches wide;

(C) Be made of a material expected to last the lifetime of the wood heater;

(D) Present required information in a manner so that it is likely to remain legible for the lifetime of the wood heater; and

(E) Be affixed in such a manner that it cannot be removed from the appliance without damage to the label.

(4) The permanent label may be combined with any other label, as long as the required information is displayed, and the integrity of the permanent label is not compromised.

(b) If the wood heater belongs to a model line certified under § 60.533, and has not been found to exceed the applicable emission limits or tolerances through quality assurance testing, one of the following statements, as appropriate, shall appear on the permanent label:

"U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified to comply with July, 1988, particulate emission standards. Not approved for sale after June 30, 1992."

or

"U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified to comply with July, 1990, particulate emission standards.

(c)(1) If compliance is demonstrated under § 60.530(c), the following statement shall appear on the permanent label:

"U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified under 40 C.F.R. 60.530(c). Not approved for sale after June 30, 1992."

(2) If compliance is demonstrated under § 60.530(h), one of the following statements, as appropriate, shall appear on the permanent label:

"U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified under 40 C.F.R. 60.533(h) to comply with July, 1988 particulate emissions standards. Not approved for sale after June 30, 1992."

or

"U.S. ENVIRONMENTAL PROTECTION AGENCY
Certified under 40 C.F.R. 60.533(h), to comply with July, 1990 particulate emissions standards."

(d) Any label statement under paragraph (b) or (c) constitutes a representation by the manufacturer as to any wood heater that bears it (i) that certification was in effect at the time the wood heater left the hands of the manufacturer, (ii) that the manufacturer was, at the time the label was affixed, conducting a quality assurance program in conformity with § 60.533(o), (iii) that as to any wood heater individually tested for emissions by the manufacturer under § 60.533(o)(3), that it met the applicable emissions standards, and (iv) that as to any wood heater individually inspected for tolerances under § 60.533(o)(2), that the wood heater is within applicable tolerances.

(e) If an affected facility is exempt from the emission standards in § 60.532 under the provisions of § 60.530(d), the following statement shall appear on the permanent label:

"U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Approved for sale until June 30, 1991."

(f)(1) If an affected facility is manufactured in the U.S. for export, the following statement shall appear on the permanent label:

"U.S. ENVIRONMENTAL PROTECTION AGENCY

Export stove. May not be operated within the

United States."

(2) If an affected facility is manufactured for use ~~solely~~ for research and development purposes as provided in section 60.530(g), the following statement shall appear on the permanent label:

"U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Research Stove.

Not approved for sale."

(3) If an affected facility is a coal-only heater, the following statement shall appear on the permanent label:

"U.S. ENVIRONMENTAL PROTECTION AGENCY

This heater is only for burning coal. Use of any

other solid fuel except for coal ignition purposes

is a violation of Federal law."

(g) Any affected facility that does not qualify for labelling under any of paragraphs (b) through (f) shall bear one of the following labels:

(1) If the test conducted under section 60.533(n) indicates that the facility does not meet applicable emissions standards:

"U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Does not meet EPA particulate emission standards. IT IS AGAINST THE LAW TO OPERATE THIS WOOD HEATER."

(2) If the test conducted under section 60.533(n) indicates that the facility does meet applicable emissions standards:

"U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Meets EPA particulate emission standards."

(3) If the facility has not been tested as required by section 60.533(n):

"U.S. ENVIRONMENTAL PROTECTION AGENCY

Not certified. Not tested. Not approved for sale. IT IS AGAINST THE LAW TO OPERATE THIS WOOD HEATER."

(h) For affected facilities equipped with catalytic combustors, the following statement shall appear on the permanent label:

"This wood heater contains a catalytic combustor, which needs periodic inspection and replacement for proper operation. Consult owners manual for further information. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in the owner's manual, or if the catalytic element is deactivated or removed."

(i) The removable label of an affected facility permanently labeled under paragraph (b) or (c) of this section shall contain only the following information:

(1) A statement indicating the compliance status of the model. The statement shall be one of the statements provided in Appendix __, Section __. Instructions on the statement to select are provided in Appendix __.

(2) A graphic presentation of the composite particulate matter emission rate as determined in the certification test. The method for presenting this information is provided in Appendix __.

(3) A graphic presentation of the overall thermal efficiency of the model. The method for presenting this information is provided in Appendix __, Section __. At the discretion of the manufacturer, either the actual measured efficiency of the model or its estimated efficiency may be used for purposes of this paragraph. The actual efficiency is the efficiency measured in tests conducted pursuant to § 60.534(c). The estimated efficiency shall be 72 percent if the model is catalyst equipped and 63 percent if the model is not catalyst equipped.

(4) A numerical expression of the heat output range of the unit, in British thermal units per hour (Btu/hr) rounded to the nearest 100 Btu/hr.

(A) If the manufacturer elects to report the overall efficiency of the model based on test results pursuant to subparagraph (3) of this paragraph, he shall report the heat

output range measured during the efficiency test. If an accessory device is used in the certification test to achieve any low burn rate criterion specified in this subpart, and if this accessory device is not sold as a part of the wood heater, the heat output range shall be determined using the formula in (B) based upon the lowest sustainable burn rate achieved without the accessory device.

(B) If the manufacturer elects to use the estimated efficiency as provided in subparagraph (3) of this paragraph, he shall estimate the heat output of the model as follows:

HO_E = (19,140) x (Estimated overall efficiency/100) x BR, where

HO_E = Estimated Heat Output in Btu/hr

BR = Burn rate in dry kilograms of test fuel per hour

(5) Statements regarding the importance of operation and maintenance. Instructions on which statements must be used are provided in Appendix __, Section __.

(6) The manufacturer and the identification of the model.

(j) The removable label of an affected facility permanently labeled under paragraph (e), (f)(3) or (g) of this section shall contain only the information provided for in Appendix __, Section __.

(k) The removable label shall be affixed to a readily seen and accessible location on the wood heater when the wood heater is offered for sale to consumers by any commercial owner. This label may not be combined with any other label or information. The label shall be attached to the wood heater in such a way that it can be easily removed by the consumer upon purchase. The

removable label shall be printed on 90 pound bond paper in black ink with a white background except that models that are not otherwise exempted which do not meet the applicable emission limits or have not been tested pursuant to this subpart, shall be on a red background as described in Appendix __, Section __. The dimensions of the removable label shall be five inches by seven inches as described in Appendix __, Section __. The arrangement of the wording, the requirements for presentation of the graphic data, and the specified typography for the removable label are presented in Appendix B.

(1)(1) An owners manual required to be provided under this subpart shall contain the information listed in subsection (1)(2) (pertaining to installation), and subsection (1)(3) (pertaining to operation and maintenance). Such information shall be adequate to enable consumers to achieve optimal emissions performance.

(2) Installation Information: requirements for achieving proper draft.

(3) Operation and Maintenance Information:

(A) wood loading procedures, recommendations on wood selection, and warnings on what fuels not to use, such as treated wood, colored paper, cardboard, solvents, trash and garbage;

(B) fire starting procedures;

(C) proper use of air controls;

(D) ash removal procedures;

(E) instructions on gasket replacement; and

(F) for catalytic models, information on the following pertaining to the catalytic combustor: procedures for achieving and maintaining catalyst activity, maintenance procedures, procedures for determining deterioration or failure, procedures for replacement, and information on how to exercise warranty rights;

(G) for catalytic models, the following statement

> "This wood heater contains a catalytic combustor, which needs periodic inspection and possible replacement for proper operation. It is against the law to operate this wood heater in a manner inconsistent with operating instructions in this manual, or if the catalytic element is deactivated or removed."

(4) Any manufacturer using EPA model language to satisfy any requirement of this paragraph shall be in compliance with that requirement, provided that the particular model language is printed in full, with only such changes as are necessary to insure accuracy for the particular model line.

§ 60.537 Reporting and recordkeeping.

(a)(1) Each manufacturer who holds a certificate of compliance under § 60.533(e) or § 60.533(h) for a model line shall maintain records containing the information required by this paragraph with respect to that model line.

(2)(A) All documentation pertaining to the certification test used to obtain certification, including the full test report

and raw data sheets, laboratory technician notes, calculations, and the test results for all test runs.

(B) Where a model line is certified under § 60.533(h) and later certified under § 60.533(e), all documentation pertaining to the certification test used to obtain certification in each instance shall be retained.

(3) For parameter inspections conducted pursuant to § 60.533(o)(2), information indicating the extent to which tolerances for components that affect emissions as listed in § 60.533(k)(2) were inspected, and at what frequency, the results of such inspections, remedial actions taken, if any, and any follow-up actions such as additional inspections.

(4) For emissions tests conducted pursuant to § 60.533(o)(3), all test reports, data sheets, laboratory technician notes, calculations, and test results for all test runs, the remedial actions taken, if any, and any follow-up actions such as additional testing.

(5) The number of affected facilities that are sold each year, and to whom they were sold.

(b)(1) Each accredited laboratory shall maintain records consisting of all documentation pertaining to each certification test, including the full test report and raw data sheets, technician notes, calculations, and the test results for all test runs.

(2) Each accredited laboratory shall report to the Administrator by the 8th day of each month between March 1, 1987 and July 1, 1990:

(A) The number and identification of wood heaters scheduled for testing;

(B) The estimated date on which certification testing could commence for a wood heater, if such a test were requested on the first day of that month;

(C) The Identification of the wood heaters tested for purposes of certification during the previous month.

(3) Each accredited laboratory shall report to the Administrator within 24 hours whenever a manufacturer which has notified the laboratory that it intends to apply for alternative certification for a model line fails to submit on schedule a representative unit of that model line for certification testing.

(c) Any wood heater upon which certification tests were performed based upon which certification was granted under § 60.533(e) shall be retained, sealed and unaltered for as long as the model line in question is manufactured. Any such wood heater shall be made available upon request to the Administrator for inspection and testing. The requirements of this paragraph may be satisfied by either the manufacturer or the testing laboratory.

(d) Each commercial owner of an affected facility shall maintain records of the name and address of each person to whom he sells or transfers an affected facility, the model of the affected facility, and for commercial owners who are not manufacturers, the identity of the manufacturer.

(e) Any manufacturer seeking exemption under § 60.530(d) shall:

(1) Report to the Administrator by September 1, 1988, the number of wood heaters manufactured between July 1, 1987 and July 1, 1988, and evidence that he was a manufacturer of wood heaters as of January 1, 1987;

(2) Report to the Administrator by September 1, 1989 the number of uncertified wood heaters manufactured that were subject to paragraph § 60.530(d), between July 1, 1988 and July 1, 1989.

(3) Maintain wood heater production records covering the period July 1, 1987 to July 1, 1989.

(f) Each manufacturer of an affected facility certified under § 60.533 shall submit a report to the Administrator every (2) years following issuance of a certificate of compliance for each model line. This report shall certify that no changes in the design or manufacture of this model line have been made that require recertification under § 60.533(k).

(g) Each manufacturer shall maintain records of the model and number of wood heaters exempted under § 60.530(g).

(h) Each commercial owner of a wood heater previously owned by a noncommercial owner for his personal use shall maintain records of the name and address of the previous owner.

(i)(1) Unless otherwise specified, all records required under this section shall be maintained by the manufacturer or commercial owner of the affected facility for a period of no less than 5 years.

(2) Unless otherwise specified, all reports to the Administrator required under this subpart shall be made to: Stationary Source Compliance Division (EN-341), U.S. EPA, 401 M

Street, S.W., Washington, D.C., 20460 Attention: Wood Heater Program.

(3) A report to the Administrator required under this subpart shall be deemed to have been made when it is properly addressed and mailed, or placed in the possession of a commercial courier service.

§ 60.538 Prohibitions.

(a) No person shall operate an affected facility that does not have affixed to it a permanent label pursuant to § 60.536(b), (c), (e) or (g)(2).

(b) No manufacturer shall advertise for sale, offer for sale, or sell an affected facility that (1) does not have affixed to it a permanent label pursuant to § 60.536 and (2) that has not been tested when required by § 60.533(n).

(c) On or after July 1, 1990, no commercial owner shall advertise for sale, offer for sale, or sell an affected facility that does not have affixed to it a permanent label pursuant to § 60.536(b), (c), (e), (f)(3), (g)(1) or (g)(2). No person shall advertise for sale, offer for sale, or sell an affected facility labelled under subsection (f)(1) except for export.

(d)(1) No commercial owner shall offer for sale or sell an affected facility permanently labelled under § 60.535(b) or (c) unless

(A) the affected facility has affixed to it a removable label pursuant to § 60.536 of this subpart,

(B) He provides any purchaser or transferee with an owners manual pursuant to § 60.536(1) of this subpart; and

(C) He provides any purchaser or transferee with a copy of the catalytic combustor warranty (for affected facilities with catalytic combustors).

(2) No commercial owner shall offer for sale or sell an affected facility permanently labelled under § 60.536(e), (f)(3), or (g), unless the affected facility has affixed to it a removable label pursuant to § 60.536 of this subpart.

(3) A commercial owner other than a manufacturer complies with the requirements of paragraph (d) of this section if he (A) receives the required documentation from the manufacturer or a previous commercial owner and (B) passes that documentation on unaltered to any person to whom the wood heater that it covers is sold or transferred.

(e) In any case in which the Administrator revokes a certificate of conformity for the knowing submission of false or inaccurate information, or other fraudulent acts, he may give notice of that revocation and the grounds for it to all commercial owners. From and after the date of receipt of that notice no commercial owner may sell any wood heater covered by the revoked certificate (other than to the manufacturer) unless (1) it has been tested as required by § 60.533(n) and labelled as required by § 60.536(g), or (2) the model line has been recertified in accordance with this subpart.

(f) No person shall install or operate an affected facility except in a manner consistent with the instructions on its permanent label and in the owners manual pursuant to § 60.537(c) of this subpart.

(g) No person shall operate an affected facility which was originally equipped with a catalytic combustor if the catalytic element is deactivated or removed.

(h) No person shall operate an affected facility that has been physically altered to exceed the tolerance limits of its certificate of conformity.

(i) No person shall alter, deface, or remove any permanent label required to be affixed pursuant to § 60.536 of this subpart.

§ 60.539. Hearing and Appeal Procedures

(a)(1) In any case where the Administrator (A) denies an application under § 60.530(c) or § 60.533(e); (B) issues a notice of revocation of certification under § 60.533(1); (C) denies an application for laboratory accreditation under § 60.533(b); or (D) issues a notice of revocation of laboratory accreditation under § 60.535(e), the manufacturer or laboratory affected may request a hearing under this section within thirty days following receipt of the required notification of the action in question.

(2) In any case where the Administrator issues a notice of revocation under § 60.533(p), the manufacturer may request a

hearing under this section with the time limits set out in § 60.533(p)(5)(I).

(b) Any hearing request shall be in writing, shall be signed by an authorized representative of the petitioning manufacturer or laboratory, and shall include a statement setting forth with particularity the petitioner's objection to the Administrator's determination or proposed determination.

(c)(1) Upon receipt of a request for a hearing under paragraph (a), the Administrator shall request the Chief Administrative Law Judge to designate an Administrative Law Judge as Presiding Officer for the hearing. If the Chief Administrative Law Judge replies that no Administrative Law Judge is available to perform this function, the Administrator shall designate a Presiding Officer who has not had any prior responsibility for the matter under review, and who is not subject to the direct control or supervision of someone who has had such responsibility.

(2) The hearing shall commence as soon as practicable at a time and place fixed by the Presiding Officer.

(3)(A) A motion for leave to intervene in any proceeding conducted under this section must set forth the grounds for the proposed intervention, the position and interest of the movant and the likely impact that intervention will have on the expeditious progress of the proceeding. Any person already a party to the proceeding may file an answer to a motion to intervene, making specific reference to the factors set forth in the foregoing sentence and subsection (3)(c) of this paragraph,

within ten (10) days after service of the motion for leave to intervene.

(B) A motion for leave to intervene in a proceeding must ordinarily be filed before the first prehearing conference or, in the absence of a prehearing conference, prior to the setting of a time and place for a hearing. Any motion filed after that time must include, in addition to the information set forth in subsection (3)(A) of this paragraph, a statement of good cause for the failure to file in a timely manner. The intervenor shall be bound by any agreements, arrangements and other matters previously made in the proceeding.

(C) Leave to intervene may be granted only if the movant demonstrates that (i) his presence in the proceeding would not unduly prolong or otherwise prejudice the adjudication of the rights of the original parties; (ii) the movant may be adversely affected by a final order; and (iii) the interests of the movant may not be adequately represented by the original parties. The intervenor shall become a full party to the proceeding upon the granting of leave to intervene.

(D) Persons not parties to the proceeding who wish to file amicus curiae briefs may so move. The motion shall identify the interest of the applicant and shall state the reasons why the proposed amicus brief is desirable. If the motion is granted, the Presiding Officer or Administrator shall issue an order setting the time for filing such brief. An amicus curiae is eligible to participate in any briefing after his motion is

granted, and shall be served with all briefs, reply briefs, motions, and orders relating to issues to be briefed.

(4) In computing any period of time prescribed or allowed in this subpart, the day of the event from which the designated period begins to run shall not be included. Saturdays, Sundays, and Federal legal holidays shall be included. When a stated time expires on a Saturday, Sunday or legal holiday, the stated time period shall be extended to include the next business day.

(d)(1) Upon his appointment the Presiding Officer shall establish a hearing file. The file shall consist of the notice issued by the Administrator under § 60.530(c), § 60.533(e), § 60.533(l), § 60.533(p), § 60.535(a), or § 60.535(d), together with any accompanying material, the request for a hearing and the supporting data submitted therewith, and all documents relating to the request for certification or accreditation, or the proposed revocation of either.

(2) The hearing file shall be available for inspection by any party, to the extent authorized by law, at the office of the Presiding Officer, or other place designated by him.

(e) Any party may appear in person, or may be represented by counsel or by any other duly authorized representative.

(f)(1) The Presiding Officer upon the request of any party, or in his discretion, may order a prehearing conference at a time and place specified by him to consider the following:

(A) Simplification of the issues;

(B) Stipulations, admissions of fact, and the introduction of documents;

(C) Limitation of the number of expert witnesses;

(D) Possibility of agreement disposing of all or any of the issues in dispute;

(E) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(g)(1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to penalties under title 18 U.S.C. § 1001 for knowingly making false statements or representations or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be recorded verbatim. Copies of transcripts of proceedings may be purchsed by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearings shall, upon a

showing satisfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(h)(1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator. Except as provided in paragraph (3) below, any such appeal shall be taken within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

(3) In any hearing requested under paragraph (a)(2) of this section the Presiding Officer shall render his initial decision

within 60 days of that request. Any appeal to the Administrator shall be taken within ten days of the initial decision, and the Administrator shall render his decision in that appeal within 30 days of the filing of the appeal.

APPENDIX 2

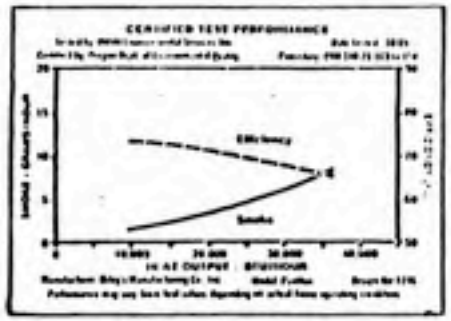
OREGON DEQ CERTIFIED WOODSTOVES

AND THEIR EMISSION PROFILES

Oregon DEQ Certified Wood Stoves

MODEL DESIGN NUMBER MANUFACTURER	CATALYTIC NON-CATALYTIC	1988 OR 1990 STANDARD	AVERAGE SMOKE (GRAMS/HR)	AVERAGE OVERALL EFFICIENCY (%)	HEAT OUTPUT RANGE (BTU/HR)	BURN TIME (HOURS) LOW SETTING	BURN TIME (HOURS) HIGH SETTING
Blaze King "King," KEJ-1101 Woodstuvers Mfg.	C	1988 1990	1.8	78.0	8,610 to 36,200	16.2	4.4
Bosca FS 500 Brugger Industries Ltd.	NC	1988	13.5	64.8	9,832 to 36,307	3.6	1.0
Answer A1 Logs International, Ltd.	NC	1990	14.8	62.1	4,867 to 43,360	8.3	0.75
Answer A2 Logs International, Ltd.	NC	1988	14.8	62.1	4,867 to 43,360	8.3	0.75
Rawhide I Rinaldi Mahanon Industries	NC	1988	13.8	66.8	20,707 to 34,812	2.4	1.1
Fisher TECH IV Casos Industries	C	1988 1990	2.8	78.1	18,033 to 31,794	8.6	2.8
Pessler FB-1 Pessler, Inc.	NC	1988 1990	8.7	78.4	8,466 to 28,830	N/A	N/A
Timber Ess 477 Timber Ess, Inc.	C	1988 1990	2.0	76.8	6,880 to 21,980	11.4	3.4
Vista 640 The Stack Mfg., Co., Ltd.	NC	1988 1990	8.4	61.8	20,829 to 60,104	1.8	0.8
Tile Fire Mark II LPE 36610 Kent Heating, Ltd.	NC	1988	14.2	64.8	8,988 to 30,062	8.0	1.8
Answer A3 Logs International, Ltd.	NC	1988	14.8	62.1	4,867 to 43,360	8.3	0.75
Regent 1000 2 Osburn Industries	NC	1988	12.8	66.2	8,250 to 40,981	8.6	1.0
Bosca TM500 Brugger Industries Ltd.	NC	1988	13.8	64.8	9,832 to 36,307	3.6	1.0
ATS-II 5000 Arrow Tubesun, Inc.	C	1988 1990	2.8	75.8	8,268 to 31,836	6.6	1.8
1000C E.S. 01 The Earth Stove, Inc.	C	1988 1990	3.6	74.8	10,873 to 34,416	7.3	3.0
1002-0 E.S. 02 The Earth Stove, Inc.	NC	1988 1990	6.6	66.7	27,366 to 44,866	2.8	1.8
Catalytic Fir AK-18 Sweet Home Stove Works	C	1988 1990	2.0	76.2	8,876 to 27,308	7.8	2.3
Leopard U248 Oxley's Mfg., Co., Inc.	C	1988 1990	2.6	72.0	8,366 to 26,867	7.3	1.8
Panther F248 Oxley's Mfg. Co., Inc.	C	1988 1990	2.8	72.0	8,366 to 26,867	7.3	1.8
3A 36 01 22 Jotul	NC	1988 1990	7.8	70.8	28,213 to 36,342	1.8	1.1
3C 36 01 23 Jotul	C	1988 1990	3.8	72.0	7,832 to 26,868	6.3	1.2
8A 36 01 24 Jotul	NC	1988 1990	7.2	68.8	30,360 to 84,442	1.8	1.1
8C 36 01 24 Jotul	C	1988	8.0	76.0	7,267 to 39,198	8.8	1.8
Turbo 18 wC Burning Log	C	1988 1990	3.1	78.0	12,864 to 36,360	8.6	2.2
Turbo 18 NC Burning Log	NC	1988	13.4	67.7	16,966 to 42,732	3.8	1.8
Country Comfort CC100 Orrville Products, Inc.	NC	1988 1990	6.8	66.8	8,318 to 30,804	4.8	1.4
Whitetail WP-1 Pyro Industries, Inc.	NC	1988 1990	8.8	78.1	8,466 to 28,837	N/A	N/A
Bill 1 Security Chimneys, Inc.	NC	1988 1990	4.8	66.8	25,030 to 46,436	1.8	0.7
Vigilant EE 0033, 0034 Vermont Castings, Inc.	C	1988	4.2	73.0	10,466 to 36,042	9.3	2.3
Resolute EE 0037,0038 Vermont Castings, Inc.	C	1988	6.8	72.4	7,228 to 26,478	8.3	1.8
Fireplace Insert 0044 Vermont Castings, Inc.	NC	1988	10.8	60.8	36,244 to 57,217	1.3	.83
Country Flame B-6 Mt. Vernon Fireplace, Inc.	C	1988 1990	3.1	74.8	8,798 to 47,783	14.8	2.8
Country Flame B-1 Mt. Vernon Fireplace, Inc.	C	1988 1990	3.1	74.8	8,798 to 47,783	14.8	2.8
Convector II 801 Lopi Associates, Inc.	NC	1988 1990	7.2	66.1	23,446 to 31,871	3.8	2.1
CB4426 4426-1 Regency Fireplace	C	1988 1990	3.8	77.8	13,821 to 34,813	7.8	2.7

PANTHER - F246



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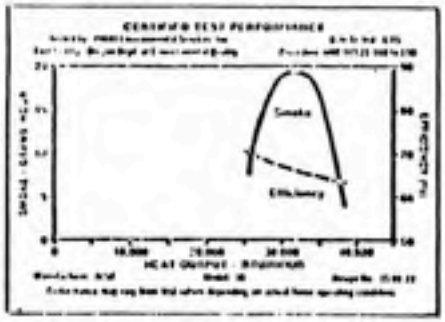

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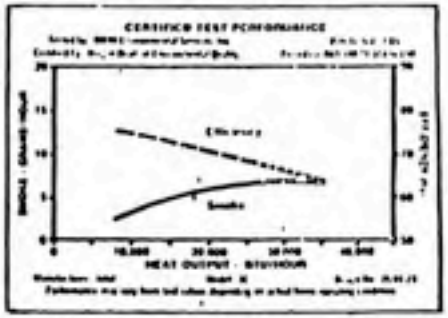

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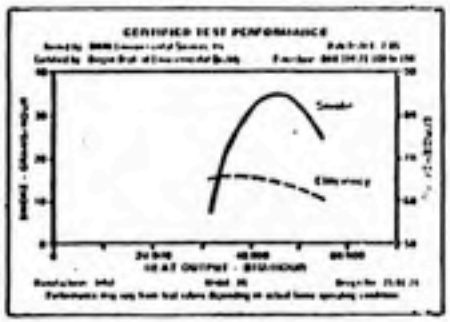

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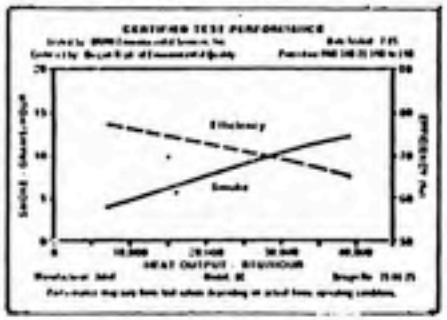
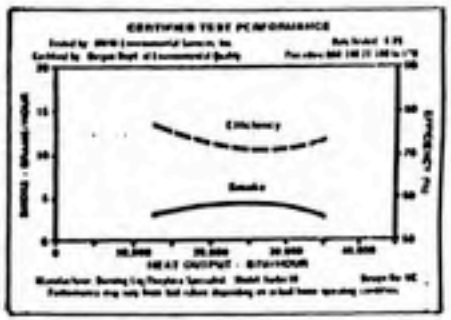


TURBO 10 - WC



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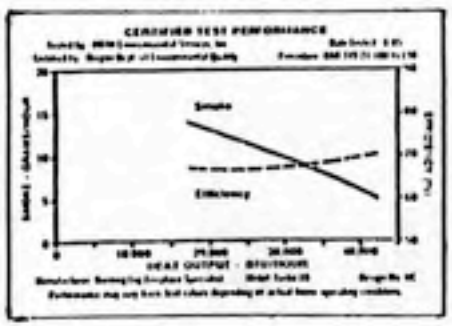

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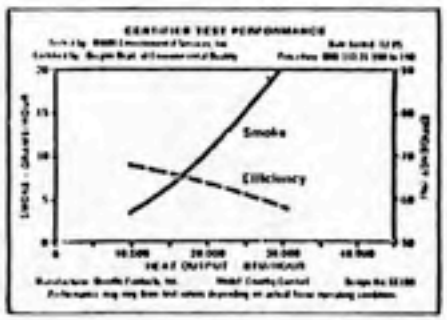

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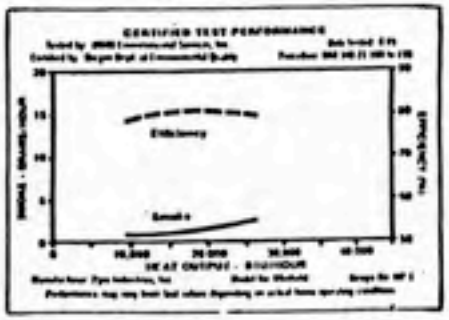
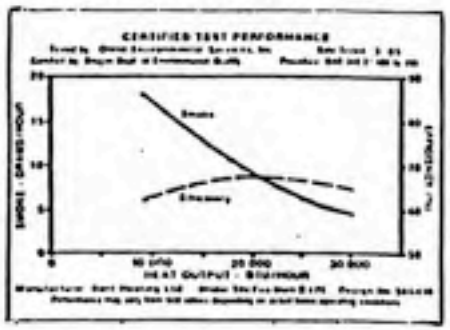
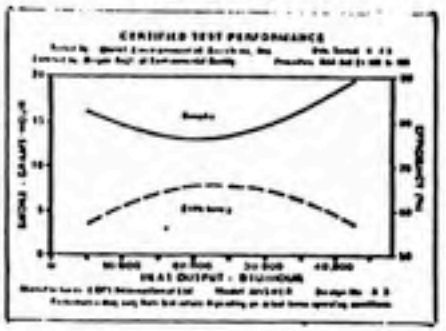


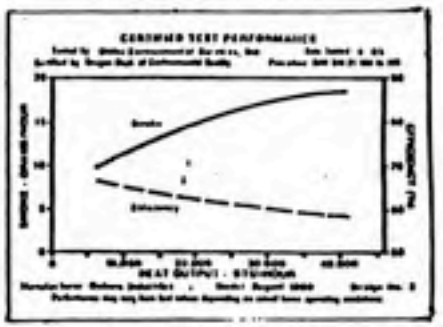
TILE FIRE MARK II IPE - 566410



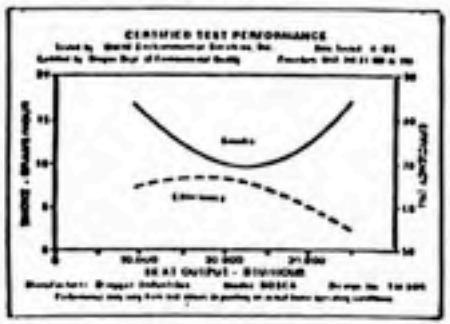
ANSWER - A3



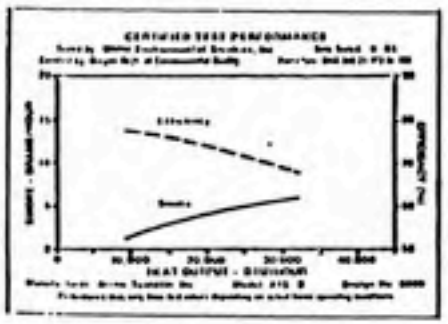
REGENT 1000 - 2



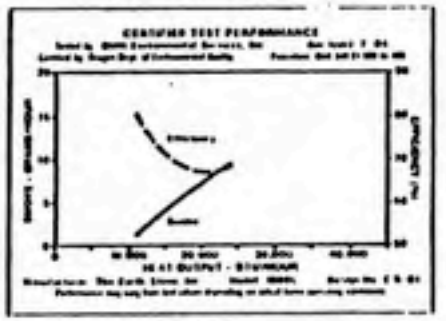
ROSCA - TH 500



ATS-II - 5000



1000C - E.S. 01



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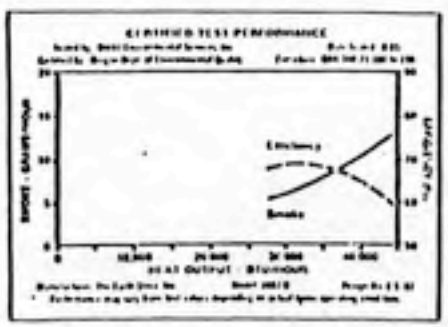
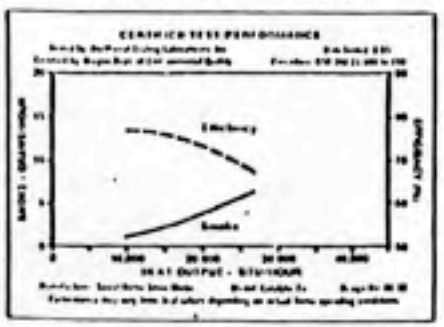
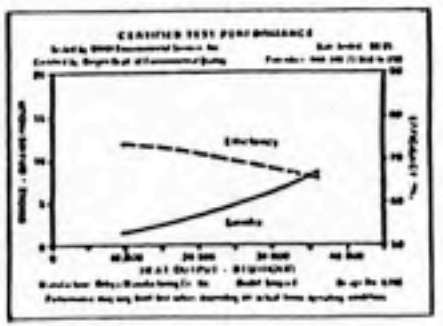


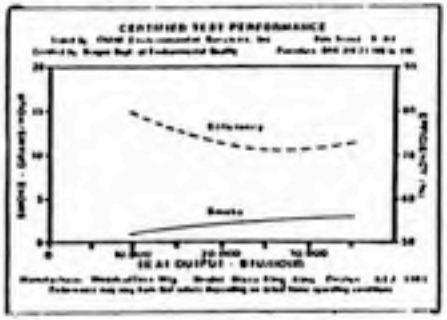
CATALYTIC FIR - AX-18



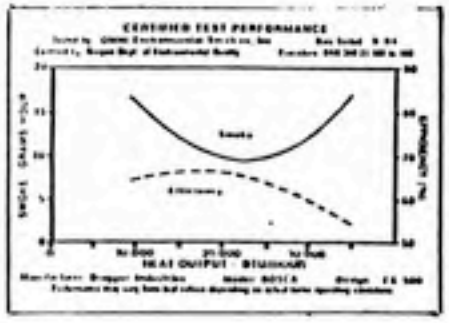
LEOPARD - U246



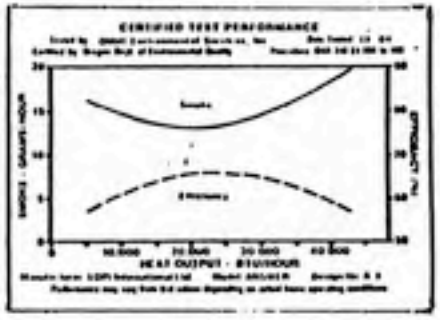
BLAZE KING - KING



BOSCA - FS 500



ANSWER - A1



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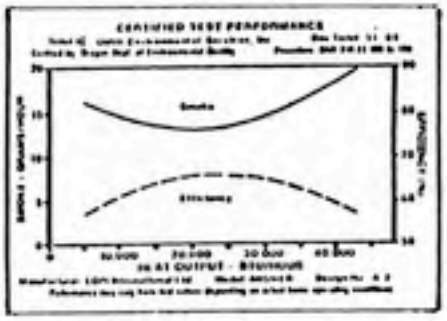
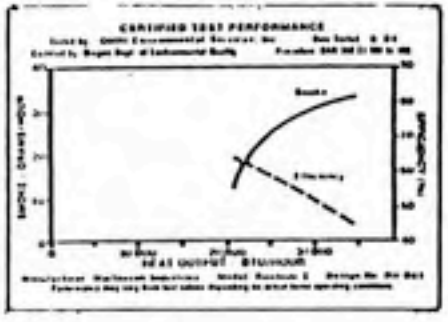
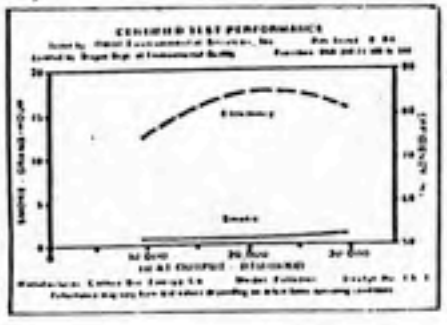


RAMHIDE I - RHDG1

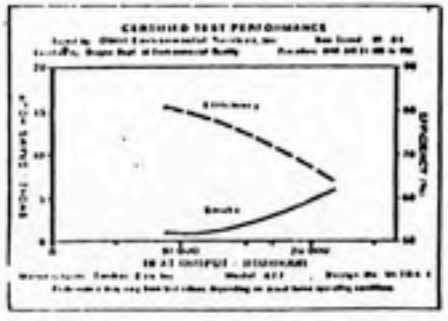


FISHER - TECH IV

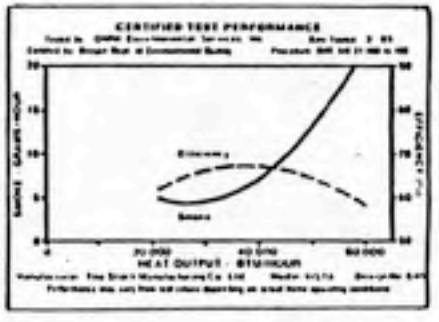
PELLETIER - FS-1



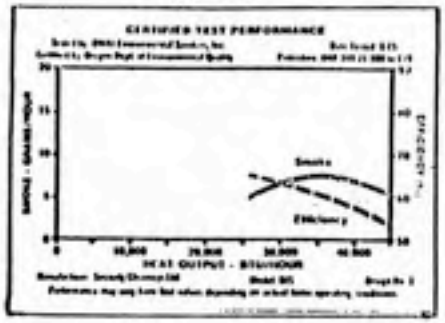
TIMBER LZE - 477



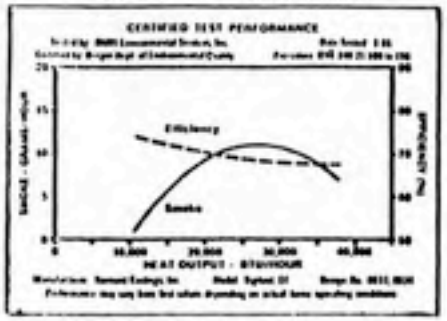
VISTA - 640



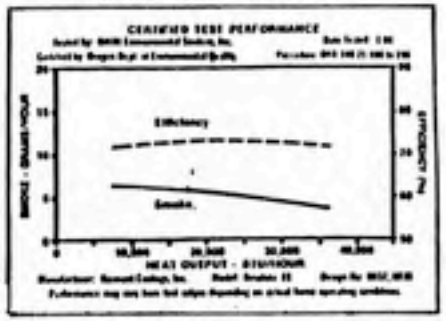
BIS - 1



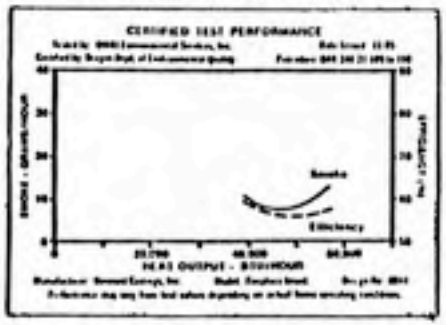
VIGILANT EE - 0033, 0034



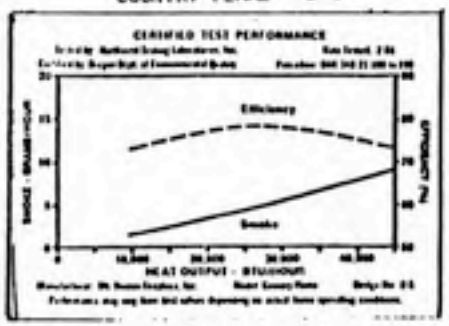
RESOLUTE EE - 0037, 0038



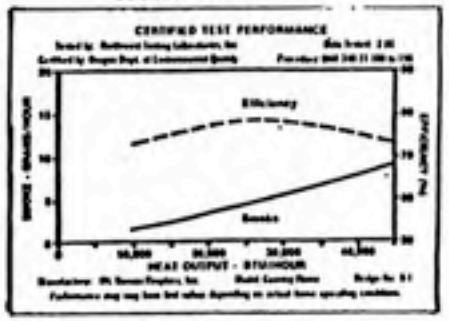
FIREPLACE INSERT - 0044



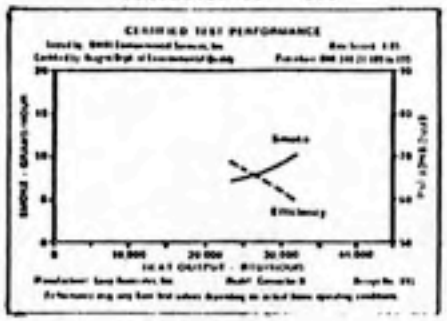
COUNTRY FLAME - B-6



COUNTRY FLAME - B-1



CONVECTOR II - G01



CB4426 - 4426-1