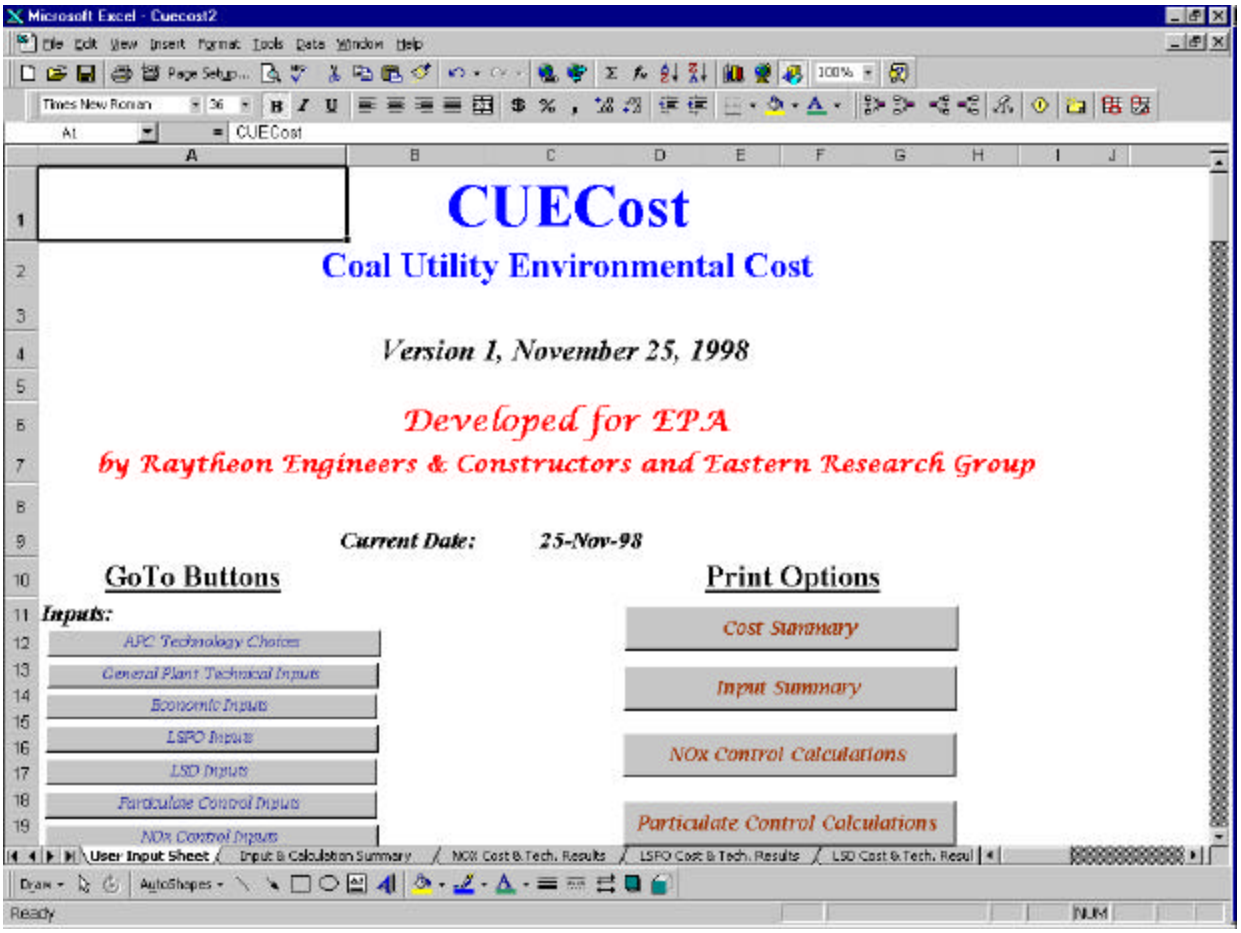
APPENDIX E
INPUT SPREADSHEET SCREENS

E-1.0 Getting Started

After downloading the model to the hard drive, the first thing needed to be done is to create a copy of the workbook and save it under a different name. Once the workbook has been saved to the hard drive, it can be opened using Microsoft Excel 5.0 or newer.

The workbook will originally open to the "User Input Sheet". This is the worksheet where all of the necessary inputs are entered. This is also where all of the "GoTo" buttons and print options are located. The first screen the User will encounter is:



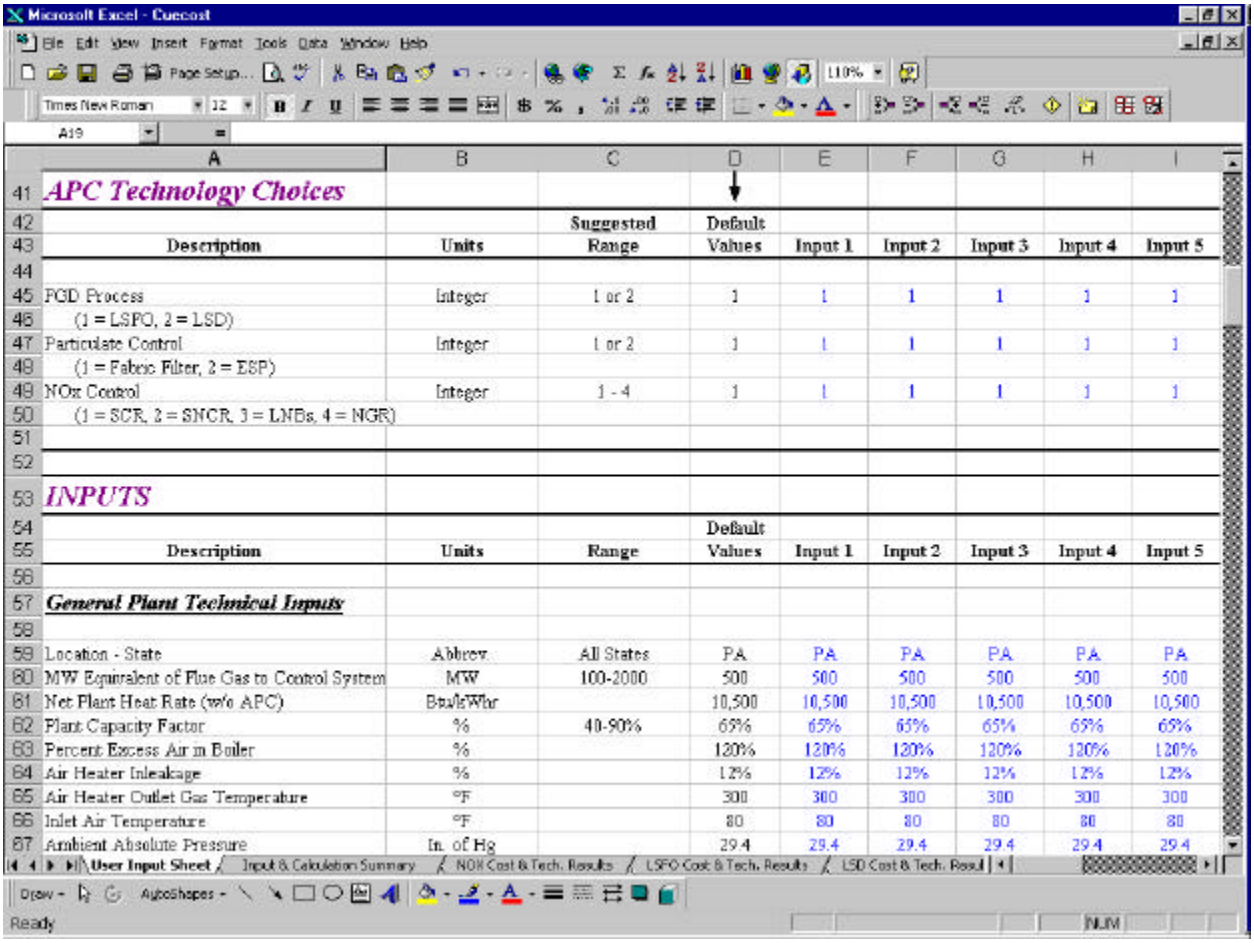
E-2.0 Inputs

As the User proceeds down the worksheet he will encounter the following input areas:

- Air Pollution Control (APC) Technology Choices
- General Plant Technical Inputs
- Economic Inputs
- Limestone Forced Oxidation (LSFO) Inputs
- Lime Spray Dryer (LSD) Inputs
- Particulate Control Inputs
- NOx Control Inputs

E-2.1 APC Technology Choices

This is the area of the worksheet where the User can choose what control technologies are needed. The following screen shows how this area looks and what options are available.



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	A	B	C	D	E	F	G	H	I
41	***APC Technology Choices***								
42			Suggested	Default					
43	**Description**	**Units**	**Range**	**Values**	**Input 1**	**Input 2**	**Input 3**	**Input 4**	**Input 5**
44									
45	FGD Process	Integer	1 or 2	1	1	1	1	1	1
46	(1 = LSFO, 2 = LSD)								
47	Particulate Control	Integer	1 or 2	1	1	1	1	1	1
48	(1 = Fabric Filter, 2 = ESP)								
49	NOx Control	Integer	1 - 4	1	1	1	1	1	1
50	(1 = SCR, 2 = SNCR, 3 = LNBs, 4 = NGR)								
51									
52									
53	***INPUTS***								
54				Default					
55	**Description**	**Units**	**Range**	**Values**	**Input 1**	**Input 2**	**Input 3**	**Input 4**	**Input 5**
56									
57	***General Plant Technical Inputs***								
58									
59	Location - State	Abbrev.	All States	PA	PA	PA	PA	PA	PA
60	MW Equivalent of Flue Gas to Control System	MW	100-2000	500	500	500	500	500	500
61	Net Plant Heat Rate (w/o APC)	Btu/kWhr		10,500	10,500	10,500	10,500	10,500	10,500
62	Plant Capacity Factor	%	40-90%	65%	65%	65%	65%	65%	65%
63	Percent Excess Air in Boiler	%		120%	120%	120%	120%	120%	120%
64	Air Heater Inleakage	%		12%	12%	12%	12%	12%	12%
65	Air Heater Outlet Gas Temperature	°F		300	300	300	300	300	300
66	Inlet Air Temperature	°F		80	80	80	80	80	80
67	Ambient Absolute Pressure	In. of Hg		29.4	29.4	29.4	29.4	29.4	29.4

User Input Sheet | Input & Calculation Summary | NOX Cost & Tech. Results | LSFO Cost & Tech. Results | LSD Cost & Tech. Resul

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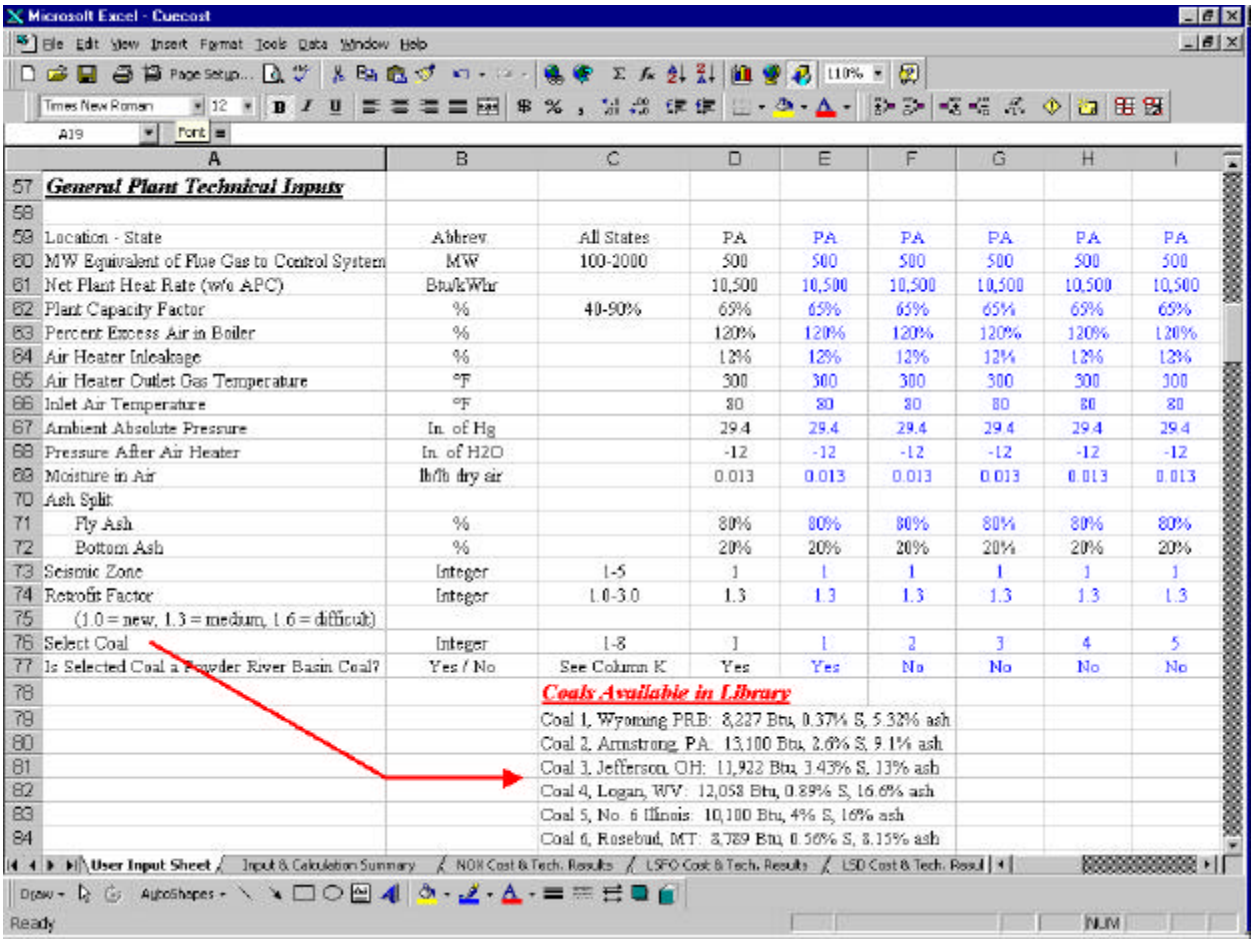
E-2.2 General Plant Technical Inputs

This is the area of the worksheet where the User inputs his plant specific data. These data are used by the worksheet to perform combustion calculations, which are then used in sizing the control equipment.



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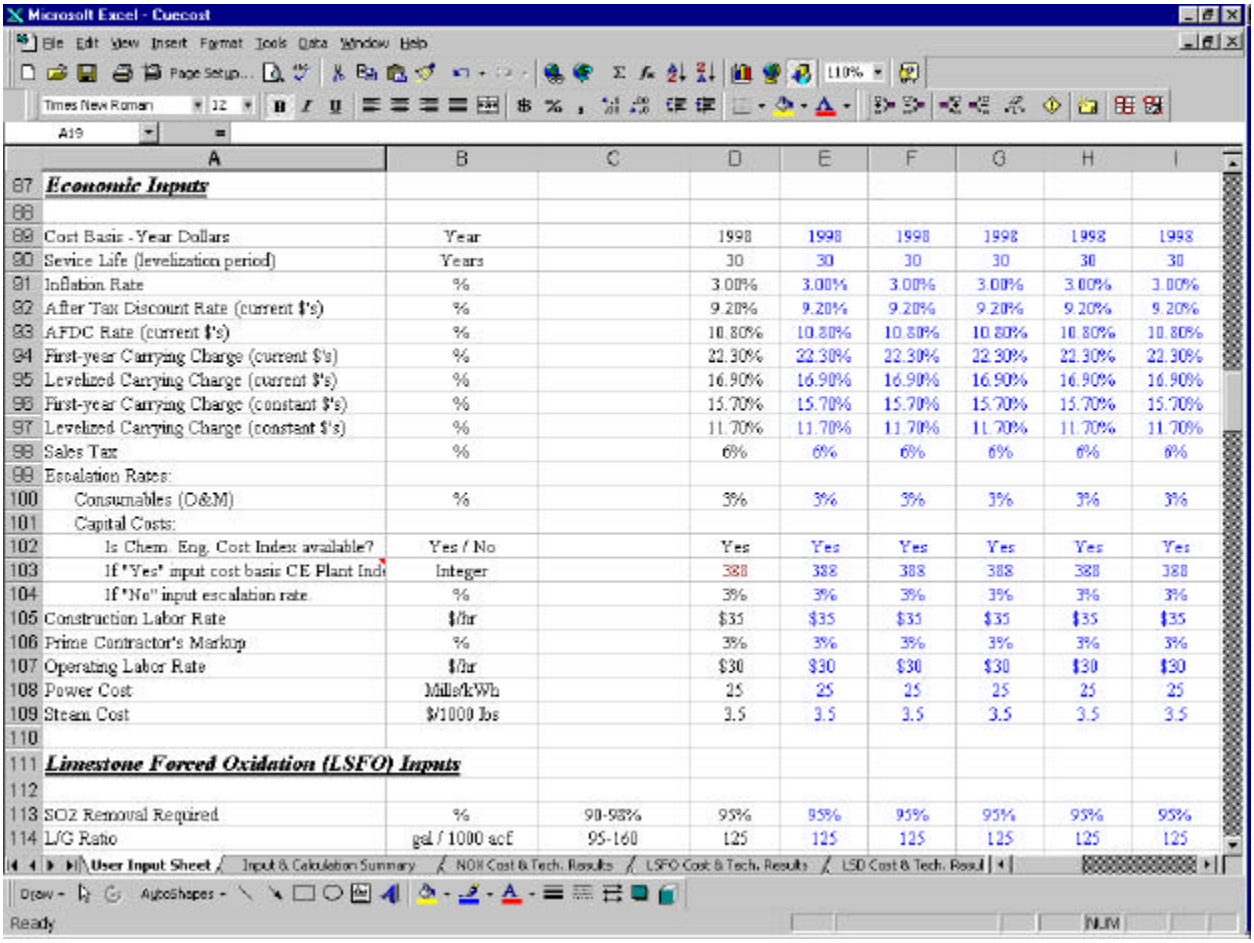
	A	B	C	D	E	F	G	H	I
57	***General Plant Technical Inputs***								
58									
59	Location - State	Abbrev.	All States	PA	PA	PA	PA	PA	PA
60	MW Equivalent of Flue Gas to Control System	MW	100-2000	500	500	500	500	500	500
61	Net Plant Heat Rate (w/o APC)	Btu/kWhr		10,500	10,500	10,500	10,500	10,500	10,500
62	Plant Capacity Factor	%	40-90%	65%	65%	65%	65%	65%	65%
63	Percent Excess Air in Boiler	%		120%	120%	120%	120%	120%	120%
64	Air Heater Inleakage	%		12%	12%	12%	12%	12%	12%
65	Air Heater Outlet Gas Temperature	°F		300	300	300	300	300	300
66	Inlet Air Temperature	°F		80	80	80	80	80	80
67	Ambient Absolute Pressure	In. of Hg		29.4	29.4	29.4	29.4	29.4	29.4
68	Pressure After Air Heater	In. of H2O		-12	-12	-12	-12	-12	-12
69	Moisture in Air	lb/lb dry air		0.013	0.013	0.013	0.013	0.013	0.013
70	Ash Split:								
71	Fly Ash	%		80%	80%	80%	80%	80%	80%
72	Bottom Ash	%		20%	20%	20%	20%	20%	20%
73	Seismic Zone	Integer	1-5	1	1	1	1	1	1
74	Retrofit Factor	Integer	1.0-3.0	1.3	1.3	1.3	1.3	1.3	1.3
75	(1.0 = new, 1.3 = medium, 1.6 = difficult)								
76	Select Coal	Integer	1-8	1	1	2	3	4	5
77	Is Selected Coal a Powder River Basin Coal?	Yes / No	See Column K	Yes	Yes	No	No	No	No
78			***Coals Available in Library***						
79			Coal 1, Wyoming PRB: 8,227 Btu, 0.37% S, 5.32% ash						
80			Coal 2, Armstrong, PA: 13,100 Btu, 2.6% S, 9.1% ash						
81			Coal 3, Jefferson, OH: 11,922 Btu, 3.43% S, 13% ash						
82			Coal 4, Logan, WV: 12,058 Btu, 0.89% S, 16.6% ash						
83			Coal 5, No. 6 Illinois: 10,100 Btu, 4% S, 16% ash						
84			Coal 6, Rosebud, MT: 8,789 Btu, 0.56% S, 8.15% ash						

E-2.3 Economic Inputs

This is the area of the worksheet where the economic factors are input. These factors are used in developing the capital and O&M costs for the control technologies.



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	A	B	C	D	E	F	G	H	I
87	***Economic Inputs***								
88									
89	Cost Basis - Year Dollars	Year		1998	1998	1998	1998	1998	1998
90	Sevice Life (levelization period)	Years		30	30	30	30	30	30
91	Inflation Rate	%		3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
92	After Tax Discount Rate (current $'s)	%		9.20%	9.20%	9.20%	9.20%	9.20%	9.20%
93	AFDC Rate (current $'s)	%		10.80%	10.80%	10.80%	10.80%	10.80%	10.80%
94	First-year Carrying Charge (current $'s)	%		22.30%	22.30%	22.30%	22.30%	22.30%	22.30%
95	Levelized Carrying Charge (current $'s)	%		16.90%	16.90%	16.90%	16.90%	16.90%	16.90%
96	First-year Carrying Charge (constant $'s)	%		15.70%	15.70%	15.70%	15.70%	15.70%	15.70%
97	Levelized Carrying Charge (constant $'s)	%		11.70%	11.70%	11.70%	11.70%	11.70%	11.70%
98	Sales Tax	%		6%	6%	6%	6%	6%	6%
99	Escalation Rates:								
100	Consumables (O&M)	%		3%	3%	3%	3%	3%	3%
101	Capital Costs:								
102	Is Chem. Eng. Cost Index available?	Yes / No		Yes	Yes	Yes	Yes	Yes	Yes
103	If "Yes" input cost basis CE Plant Ind	Integer		388	388	388	388	388	388
104	If "No" input escalation rate	%		3%	3%	3%	3%	3%	3%
105	Construction Labor Rate	$/hr		$35	$35	$35	$35	$35	$35
106	Prime Contractor's Markup	%		3%	3%	3%	3%	3%	3%
107	Operating Labor Rate	$/hr		$30	$30	$30	$30	$30	$30
108	Power Cost	Mills/kWh		25	25	25	25	25	25
109	Steam Cost	$/1000 lbs		3.5	3.5	3.5	3.5	3.5	3.5
110									
111	***Limestone Forced Oxidation (LSFO) Inputs***								
112									
113	SO2 Removal Required	%	90-98%	95%	95%	95%	95%	95%	95%
114	L/G Ratio	gal / 1000 acf	95-160	125	125	125	125	125	125

User Input Sheet | Input & Calculation Summary | NOX Cost & Tech. Results | LSFO Cost & Tech. Results | LSD Cost & Tech. Resul

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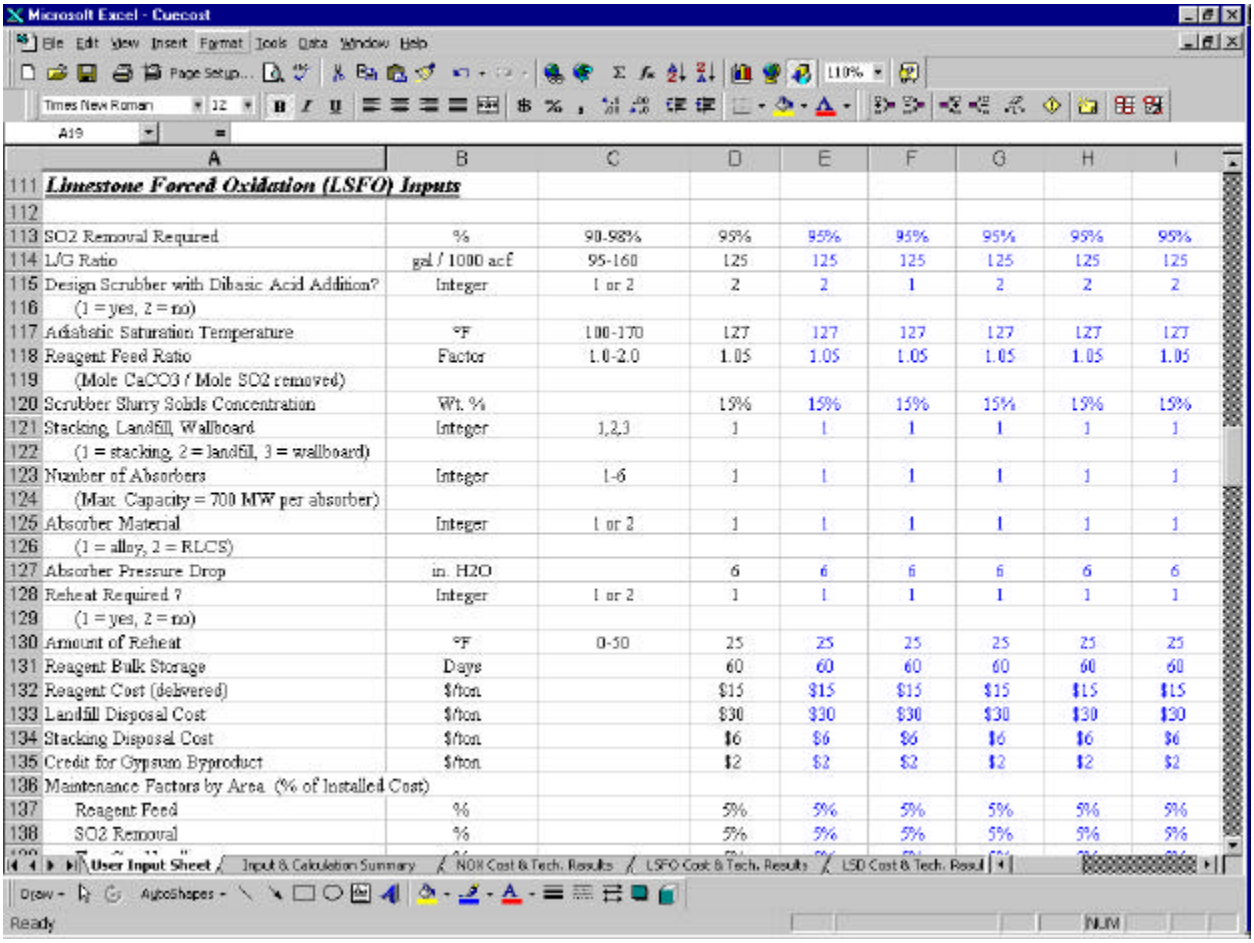
E-2.4 Limestone Forced Oxidation (LSFO) Inputs

This is where the data necessary for sizing and costing an LSFO system are input. This information is used with the combustion calculations to design the system.



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	A	B	C	D	E	F	G	H	I
111	***Limestone Forced Oxidation (LSFO) Inputs***								
112									
113	SO2 Removal Required	%	90-98%	95%	95%	95%	95%	95%	95%
114	L/G Ratio	gal / 1000 acf	95-160	125	125	125	125	125	125
115	Design Scrubber with Dibasic Acid Addition?	Integer	1 or 2	2	2	1	2	2	2
116	(1 = yes, 2 = no)								
117	Adiabatic Saturation Temperature	°F	100-170	127	127	127	127	127	127
118	Reagent Feed Ratio	Factor	1.0-2.0	1.05	1.05	1.05	1.05	1.05	1.05
119	(Mole CaCO3 / Mole SO2 removed)								
120	Scrubber Slurry Solids Concentration	Wt. %		15%	15%	15%	15%	15%	15%
121	Stacking, Landfill, Wallboard	Integer	1,2,3	1	1	1	1	1	1
122	(1 = stacking, 2 = landfill, 3 = wallboard)								
123	Number of Absorbers	Integer	1-6	1	1	1	1	1	1
124	(Max. Capacity = 700 MW per absorber)								
125	Absorber Material	Integer	1 or 2	1	1	1	1	1	1
126	(1 = alloy, 2 = RLCS)								
127	Absorber Pressure Drop	in. H2O		6	6	6	6	6	6
128	Reheat Required ?	Integer	1 or 2	1	1	1	1	1	1
129	(1 = yes, 2 = no)								
130	Amount of Reheat	°F	0-50	25	25	25	25	25	25
131	Reagent Bulk Storage	Days		60	60	60	60	60	60
132	Reagent Cost (delivered)	$/ton		$15	$15	$15	$15	$15	$15
133	Landfill Disposal Cost	$/ton		$30	$30	$30	$30	$30	$30
134	Stacking Disposal Cost	$/ton		$6	$6	$6	$6	$6	$6
135	Credit for Gypsum Byproduct	$/ton		$2	$2	$2	$2	$2	$2
136	Maintenance Factors by Area (% of Installed Cost)								
137	Reagent Feed	%		5%	5%	5%	5%	5%	5%
138	SO2 Removal	%		5%	5%	5%	5%	5%	5%

User Input Sheet | Input & Calculation Summary | NOX Cost & Tech. Results | LSFO Cost & Tech. Results | LSD Cost & Tech. Resul

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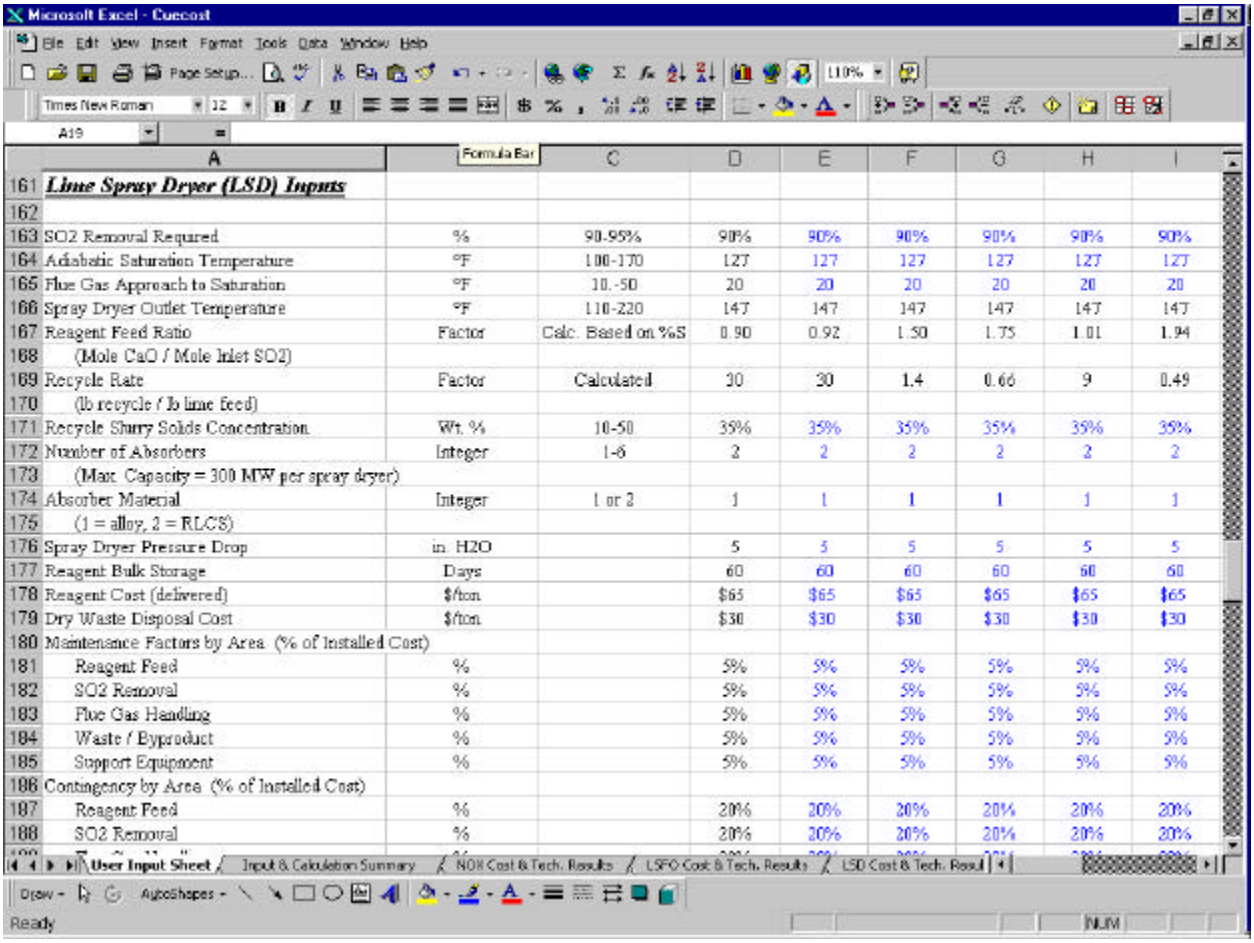
E-2.5 Lime Spray Dryer (LSD) Inputs

This is where the data necessary for sizing and costing an LSD system are input. This information is used with the combustion calculations to design the system.



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	A	Formula Bar	C	D	E	F	G	H	I
161	***Lime Spray Dryer (LSD) Inputs***								
162									
163	SO2 Removal Required	%	90-95%	90%	90%	90%	90%	90%	90%
164	Adiabatic Saturation Temperature	°F	100-170	127	127	127	127	127	127
165	Flue Gas Approach to Saturation	°F	10.-50	20	20	20	20	20	20
166	Spray Dryer Outlet Temperature	°F	110-220	147	147	147	147	147	147
167	Reagent Feed Ratio	Factor	Calc. Based on %S	0.90	0.92	1.50	1.75	1.01	1.94
168	(Mole CaO / Mole Inlet SO2)								
169	Recycle Rate	Factor	Calculated	30	30	1.4	0.66	9	0.49
170	(lb recycle / lb lime feed)								
171	Recycle Slurry Solids Concentration	Wt. %	10-50	35%	35%	35%	35%	35%	35%
172	Number of Absorbers	Integer	1-6	2	2	2	2	2	2
173	(Max. Capacity = 300 MW per spray dryer)								
174	Absorber Material	Integer	1 or 2	1	1	1	1	1	1
175	(1 = alloy, 2 = RLCS)								
176	Spray Dryer Pressure Drop	in. H2O		5	5	5	5	5	5
177	Reagent Bulk Storage	Days		60	60	60	60	60	60
178	Reagent Cost (delivered)	$/ton		$65	$65	$65	$65	$65	$65
179	Dry Waste Disposal Cost	$/ton		$30	$30	$30	$30	$30	$30
180	Maintenance Factors by Area (% of Installed Cost)								
181	Reagent Feed	%		5%	5%	5%	5%	5%	5%
182	SO2 Removal	%		5%	5%	5%	5%	5%	5%
183	Flue Gas Handling	%		5%	5%	5%	5%	5%	5%
184	Waste / Byproduct	%		5%	5%	5%	5%	5%	5%
185	Support Equipment	%		5%	5%	5%	5%	5%	5%
186	Contingency by Area (% of Installed Cost)								
187	Reagent Feed	%		20%	20%	20%	20%	20%	20%
188	SO2 Removal	%		20%	20%	20%	20%	20%	20%

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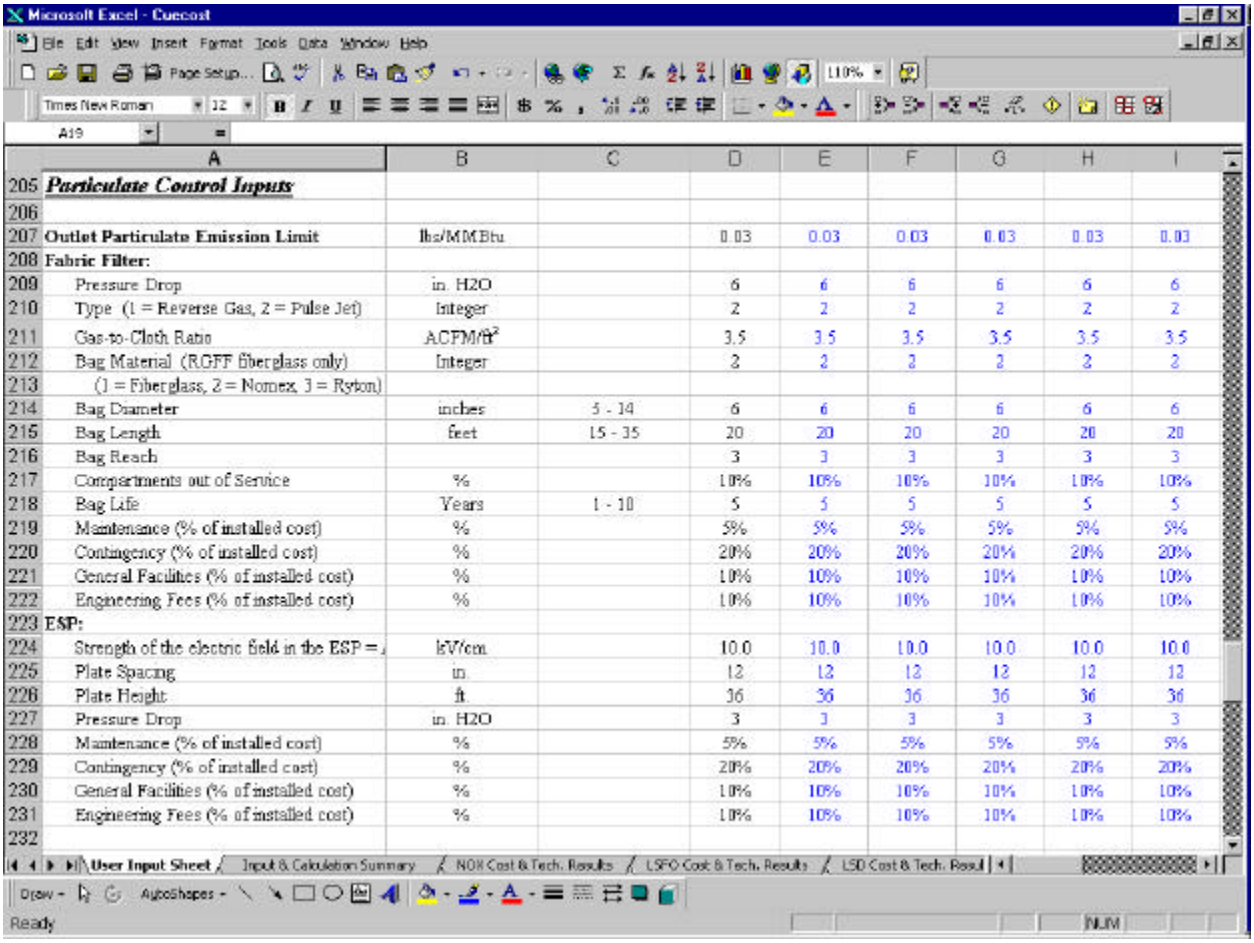
E-2.6 Particulate Control Inputs

This is where the data necessary for sizing and costing the particulate control equipment are input. This information is used with the combustion calculations to size either an ESP or fabric filter.



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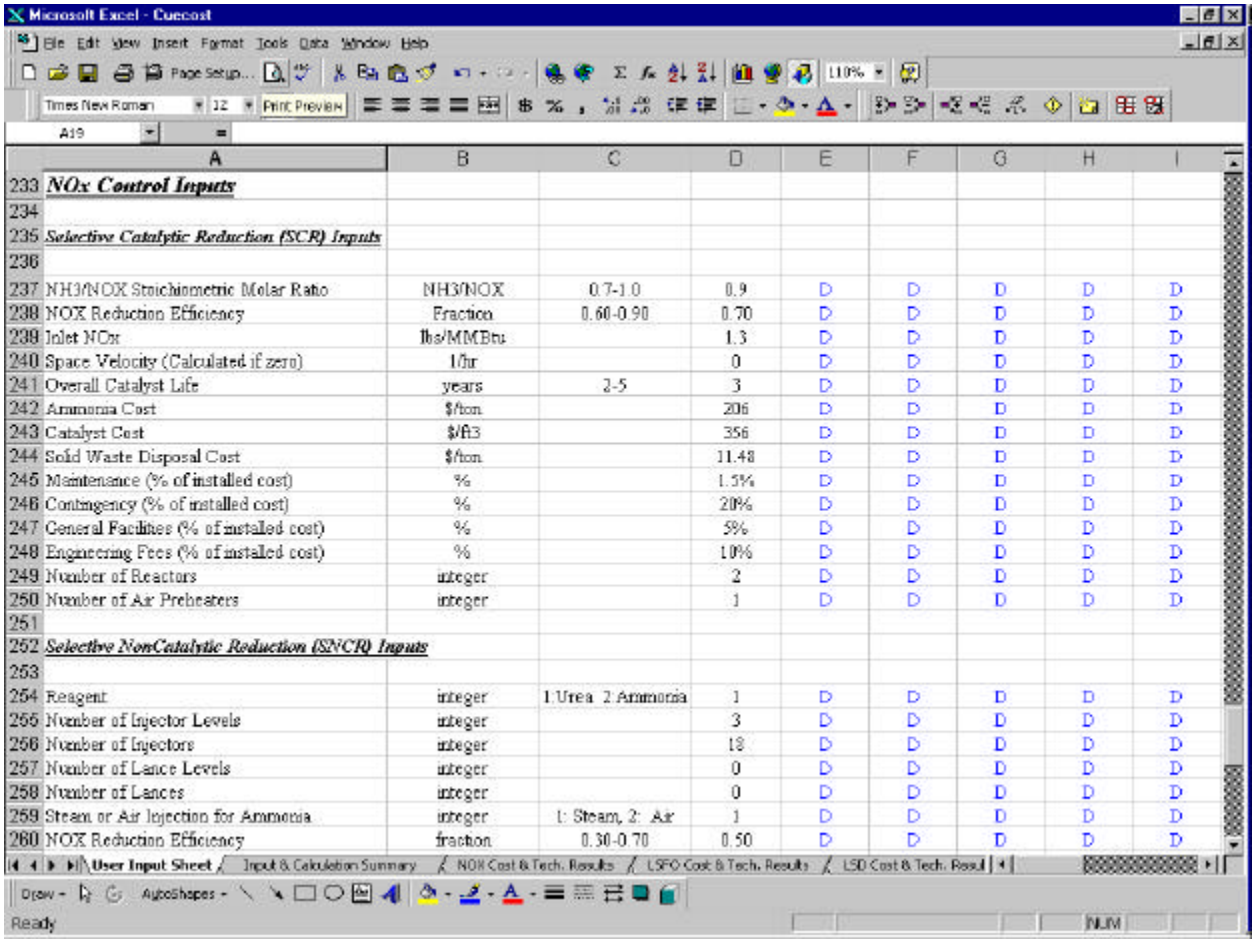
	A	B	C	D	E	F	G	H	I
205	***Particulate Control Inputs***								
206									
207	**Outlet Particulate Emission Limit**	lbs/MMBtu		0.03	0.03	0.03	0.03	0.03	0.03
208	**Fabric Filter:**								
209	Pressure Drop	in. H2O		6	6	6	6	6	6
210	Type (1 = Reverse Gas, 2 = Pulse Jet)	Integer		2	2	2	2	2	2
211	Gas-to-Cloth Ratio	ACFM/ft^2		3.5	3.5	3.5	3.5	3.5	3.5
212	Bag Material (RGFF fiberglass only)	Integer		2	2	2	2	2	2
213	(1 = Fiberglass, 2 = Nomex, 3 = Ryton)								
214	Bag Diameter	inches	5 - 14	6	6	6	6	6	6
215	Bag Length	feet	15 - 35	20	20	20	20	20	20
216	Bag Reach			3	3	3	3	3	3
217	Compartments out of Service	%		10%	10%	10%	10%	10%	10%
218	Bag Life	Years	1 - 10	5	5	5	5	5	5
219	Maintenance (% of installed cost)	%		5%	5%	5%	5%	5%	5%
220	Contingency (% of installed cost)	%		20%	20%	20%	20%	20%	20%
221	General Facilities (% of installed cost)	%		10%	10%	10%	10%	10%	10%
222	Engineering Fees (% of installed cost)	%		10%	10%	10%	10%	10%	10%
223	**ESP:**								
224	Strength of the electric field in the ESP =	kV/cm		10.0	10.0	10.0	10.0	10.0	10.0
225	Plate Spacing	in		12	12	12	12	12	12
226	Plate Height	ft		36	36	36	36	36	36
227	Pressure Drop	in. H2O		3	3	3	3	3	3
228	Maintenance (% of installed cost)	%		5%	5%	5%	5%	5%	5%
229	Contingency (% of installed cost)	%		20%	20%	20%	20%	20%	20%
230	General Facilities (% of installed cost)	%		10%	10%	10%	10%	10%	10%
231	Engineering Fees (% of installed cost)	%		10%	10%	10%	10%	10%	10%
232									

E-2.7 NOx Control Inputs

This is where the data necessary for sizing and costing the NOx control processes are input. This information is used with the combustion calculations to size one of the four processes.



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	A	B	C	D	E	F	G	H	I
233	***NOx Control Inputs***								
234									
235	***Selective Catalytic Reduction (SCR) Inputs***								
236									
237	NH3/NOX Stoichiometric Molar Ratio	NH3/NOX	0.7-1.0	0.9	D	D	D	D	D
238	NOX Reduction Efficiency	Fraction	0.60-0.90	0.70	D	D	D	D	D
239	Inlet NOx	lbs/MMBtu		1.3	D	D	D	D	D
240	Space Velocity (Calculated if zero)	1/hr		0	D	D	D	D	D
241	Overall Catalyst Life	years	2-5	3	D	D	D	D	D
242	Ammonia Cost	$/ton		206	D	D	D	D	D
243	Catalyst Cost	$/ft3		356	D	D	D	D	D
244	Solid Waste Disposal Cost	$/ton		11.48	D	D	D	D	D
245	Maintenance (% of installed cost)	%		1.5%	D	D	D	D	D
246	Contingency (% of installed cost)	%		20%	D	D	D	D	D
247	General Facilities (% of installed cost)	%		5%	D	D	D	D	D
248	Engineering Fees (% of installed cost)	%		10%	D	D	D	D	D
249	Number of Reactors	integer		2	D	D	D	D	D
250	Number of Air Preheaters	integer		1	D	D	D	D	D
251									
252	***Selective NonCatalytic Reduction (SNCR) Inputs***								
253									
254	Reagent	integer	1:Urea 2:Ammonia	1	D	D	D	D	D
255	Number of Injector Levels	integer		3	D	D	D	D	D
256	Number of Injectors	integer		18	D	D	D	D	D
257	Number of Lance Levels	integer		0	D	D	D	D	D
258	Number of Lances	integer		0	D	D	D	D	D
259	Steam or Air Injection for Ammonia	integer	1: Steam, 2: Air	1	D	D	D	D	D
260	NOX Reduction Efficiency	fraction	0.30-0.70	0.50	D	D	D	D	D

User Input Sheet | Input & Calculation Summary | NOX Cost & Tech. Results | LSFO Cost & Tech. Results | LSD Cost & Tech. Resul

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