



Federal Express
Airbill #7284302281

July 17, 1990

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JUL 18 1990

DER-BAQM

Mr. Claire Fancy
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2440

Re: Hardee Power Station
BACT Cost Analysis

Dear Mr. Fancy:

As discussed in our meeting on July 11, 1990, I have included a copy of a Hardee Power Station (HPS) BACT cost analysis for NO_x that is based on work done by the Department of Environmental Regulation (DER) for the HPS certification report. This analysis uses data provided by DER as follows:

- o 80% NO_x reduction using SCR
- o 3 year^x SCR catalyst replacement for SCR
- o 3,364 tons of NO_x removed annually, based on 100% firing of natural gas
- o \$3,592/ton cost of NO_x removed.

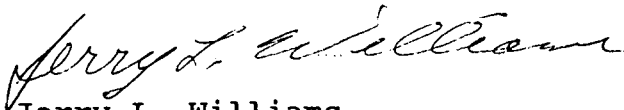
Although the applicants do not necessarily agree with the DER's assumptions, they have been included in this analysis for illustrative purposes. This analysis shows that the cost per ton of NO_x removed while burning 100% natural gas at a 100% capacity factor^x is \$3,592. For a case of burning natural gas only at a capacity factor of 80%, the cost per ton of NO_x removed is over \$4,000. This value far exceeds any \$/ton^x of NO_x removal justified as BACT to date.

When analyzing the \$/ton of NO_x removed for HPS' likely fuel combustion scenario of 80% natural gas and 20% fuel oil, the values are significantly higher.

Mr. Claire Fancy
July 17, 1990
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As discussed in our meeting, we believe that these analyses, using DER's assumptions, clearly show that SCR should not be considered BACT for the HPS.

Sincerely,



Jerry L. Williams
Director
Environmental

JLW/ams/LL404.DOC

cc: Mr. Steve Smallwood, DER (w/enc.) ✓
Mr. Hamilton Owen, DER (w/enc.)
Mr. Barry Andrews, DER (w/enc.)

Enclosure

TECO Power Services - Hardee Power Station
 SCR - THREE YEAR CATALYST REPLACEMENT

Capacity factor	20	25	40	50	80	85	86.41	90	100
% Natural Gas firing	100	100	100	100	100	100	100	100	100
% No. 2 Fuel Oil firing	0	0	0	0	0	0	0	0	0

Annual Costs, \$X1000

Direct Annual Cost									
Differential O&M Cost (2)	3,490 1,745	3,490 1,745	3,490 1,745	3,490 1,745	3,490	3,490	3,490	3,490	3,490
Ammonia (3)	120	150	240	300	480	510	518	540	600
Energy (4)									
Heat Rate Penalty	342	428	685	856	1,369	1,455	1,479	1,540	1,711
SCR Power Consumption	209	262	419	524	838	890	905	942	1,047
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
Total Direct Annual Cost	4,532	4,700	5,203	5,539	6,547	6,715	6,762	6,883	7,219

Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866

Total Annual Cost	9,398	9,566	10,070	10,405 8,660	11,413	11,581	11,628	11,749	12,085
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NOx Emissions

42ppm natural gas, tpy	841	1,051	1,682	2,103	3,364	3,574	3,634	3,785	4,205
9ppm natural gas, tpy	168	210	336	421	673	715	727	757	841
Removed, tpy	673	841	1,346	1,682	2,691	2,859	2,907	3,028	3,364

Cost Effectiveness, \$/ton	13,968	11,374	7,483	6,186	4,241	4,050	4,000	3,881	3,592
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Handwritten annotations:

- 11,371
- 9,310
- 6,184
- 5,118

TECO Power Services - Hardee Power Station
 SCR - THREE YEAR CATALYST REPLACEMENT

Capacity factor	20	25	40	50	80	85	86.41	90	100
% Natural Gas firing	80	80	80	80	80	80	80	80	80
% No. 2 Fuel Oil firing	20	20	20	20	20	20	20	20	20

Annual Costs, \$X1000

=====									
Direct Annual Cost									
Differential O&M Cost (2)	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490
Ammonia (3)	96	120	192	240	384	408	415	432	480
Energy (4)									
Heat Rate Penalty	359	448	717	896	1,434	1,524	1,549	1,614	1,793
SCR Power Consumption	168	209	335	419	670	712	724	754	838
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Direct Annual Cost	4,482	4,638	5,104	5,415	6,348	6,504	6,548	6,659	6,971
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	9,348	9,504	9,970	10,281	11,215	11,370	11,414	11,526	11,837

NOx Emissions

=====									
42ppm natural gas, tpy	673	841	1,346	1,682	2,691	2,859	2,907	3,028	3,364
9ppm natural gas, tpy	135	168	269	336	538	572	581	606	673
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Removed, tpy	538	673	1,076	1,346	2,153	2,288	2,325	2,422	2,691
	219	273	437	547	877	929	944	984	1,093
Cost Effectiveness, \$/ton	17,368	14,126	9,262	7,641	5,202	4,970	4,908	4,759	4,398
=====									

Handwritten annotations and calculations:

- Top row of Direct Annual Cost: 1,740, 1,745, 1,745, 1,745
- Vertical lines connecting Total Annual Cost to Cost Effectiveness for each scenario.
- Handwritten values for Cost Effectiveness: \$10,044, \$8,202, \$5,436, \$4,509, \$3,704, \$3,534, \$3,492, \$3,384, \$3,128.
- Handwritten note: "Gas Oil" next to the 100% capacity factor column.

TECO Power Services - Hardee Power Station
 SCR - THREE YEAR CATALYST REPLACEMENT

Capacity factor	20	25	40	50	80	85	86.41	90	100
% Natural Gas firing	60	60	60	60	60	60	60	60	60
% No. 2 Fuel Oil firing	40	40	40	40	40	40	40	40	40
Annual Costs, \$X1000									
=====									
Direct Annual Cost									
Differential O&M Cost (2)	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490	3,490
Ammonia (3)	72	90	144	180	288	306	311	324	360
Energy (4)									
Heat Rate Penalty	375	469	750	937	1,499	1,593	1,620	1,687	1,874
SCR Power Consumption	126	157	251	314	503	534	543	565	628
Lost Generation Capacity (5)	370	370	370	370	370	370	370	370	370
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Direct Annual Cost	4,433	4,576	5,005	5,291	6,150	6,293	6,334	6,436	6,723
Indirect Annual Cost									
Capital Recovery (1)	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268	4,268
Admin, Property Taxes, and Insurance	598	598	598	598	598	598	598	598	598
	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total Indirect Annual Cost	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866	4,866
Total Annual Cost	9,299	9,442	9,871	10,157	11,016	11,159	11,200	11,302	11,589
NOx Emissions									
=====									
42ppm natural gas, tpy	505	631	1,009	1,262	2,018	2,145	2,180	2,271	2,523
9ppm natural gas, tpy	101	126	202	252	404	429	436	454	505
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Removed, tpy	404	505	807	1,009	1,615	1,716	1,744	1,817	2,018
Cost Effectiveness, \$/ton	23,035	18,711	12,226	10,065	6,822	6,504	6,421	6,222	5,742
=====									

TECO Power Services - Hardee Power Station
SCR CAPITAL COSTS (\$X1000)

SCR Reactor	12,750
SCR Auxilliaries and Ammonia Storage	1,500
SCR Erection	2,625
Foundations, Ammonia System Erection & BOP Equipment	450
Contingency (10%)	1,733
Subtotal	19,058
Sales Tax (6%)	1,143
Indirect costs (14.5%)	2,763
Subtotal	22,964
Escalation (4.7%)	1,620
Total Escalated Cost	24,584
Interest During Construction	3,095
Total Capital Investment	27,679

NOTE:

1. Based on a Total Capital Investment of \$27,680,000 with a project specific capital recovery factor of 15.42%.
Administrative costs, property taxes, and insurance utilize a factor of 2.16% of Total Capital Investment. The sum of these two factors represent the project specific fixed charge rate of 17.58%.
2. Differential O&M includes maintenance & labor and catalyst replacement. Complete replacement after 3 years.
3. Ammonia cost is based on \$250/ton and a stoichmetric ratio of 1.2.
4. Energy includes auxilliary power for the SCR as well as a 0.42% CT heat rate penalty for the SCR. The additional fuel cost associated with heat rate penalty utilizes Tampa Electric Company's (TEC) current levelized fuel cost forecast of \$11.68/MBtu for natural gas and \$14.49 for oil.
Increased BOP power consumption is charged at \$99.98/MWh. This latter factor also utilized the TEC fuel cost forecast.
5. The SCR lost generation capacity is based on an 0.42% penalty. An incremental levelized demand charge of \$81.64/kW/yr was utilized based on project specific parameters.
6. SCR removal efficiency is assumed to be 80%.
7. Ammonia feed is assumed to be off when unit is being fired with oil.

FEDERAL EXPRESS

QUESTIONS? CALL 800-238-5355 TOLL FREE

AIRBILL
PACKAGE
TRACKING NUMBER

7284302292

7284302292

RECIPIENT'S COPY

Date: 7/17/90

From (Your Name) Please Print: **Jerry L. Williams**
 Your Phone Number (Very Important): **813-228-4112**
 To (Recipient's Name) Please Print: **Mr. Steve Smallwood**
 Recipient's Phone Number (Very Important):

Company: **TAMPA ELECTRIC** Department/Floor No.:
 Company: **Mr. Steve Smallwood** Department/Floor No.:
 Street Address: **Fla. Dept. of Environmental Regulation**
 Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.):

Street Address: **2600 Blair Stone Road**
 City: **TAMPA** State: **FL** ZIP Required: **33607**
 City: **Tallahassee** State: **FL** ZIP Required: **32399-2600**

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.):
PAR #445-146-23-18-281
 IF HOLD FOR PICK-UP, Print FEDEX Address Here
 Street Address:
 City: State: ZIP Required:

PAYMENT 1 Bill Sender 2 Bill Recipient's FedEx Acct. No. 3 Bill 3rd Party FedEx Acct. No. 4 Bill Credit Card
 5 Cash

SERVICES (Check only one box)
 11 YOUR PACKAGING
 16 FEDEX LETTER
 12 FEDEX PAK
 13 FEDEX BOX
 14 FEDEX TUBE
 51 STANDARD OVERNIGHT SERVICE
 56 FEDEX LETTER
 52 FEDEX PAK
 53 FEDEX BOX
 54 FEDEX TUBE
 70 HEAVYWEIGHT
 80 DEFERRED HEAVYWEIGHT
 30 ECONOMY SERVICE
 *Declared Value Limit \$100. **Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING

1 HOLD FOR PICK-UP (Fill in Box #)
 2 DELIVER WEEKDAY
 3 DELIVER SATURDAY (Extra charge) (Not available to all locations)
 4 DANGEROUS GOODS (Extra charge) (CSS not available for Dangerous Goods Shipments)
 5 CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)
 6 DRY ICE Lbs.
 7 OTHER SPECIAL SERVICE
 8
 9 SATURDAY PICK-UP (Extra charge)
 10
 11
 12 HOLIDAY DELIVERY (if offered) (Extra charge)

PACKAGES	WEIGHT in Pounds Only	YOUR DECLARED VALUE	OVERSIZE
Total	Total	Total	
DIM. SHIPMENT (Heavyweight Services Only)			
<input type="checkbox"/>	Received At:		
<input type="checkbox"/>	Regular Stop	3 <input type="checkbox"/> Drop Box	
<input type="checkbox"/>	On-Call Stop	4 <input type="checkbox"/> B.S.C.	
		5 <input type="checkbox"/> Station	
FedEx Emp. No.			

Emp. No.: Date:
 Federal Express Use:
 Base Charges:
 Declared Value Charge:
 Other 1:
 Other 2:
 Total Charges:
 REVISION DATE 11/89
 PART #119501 FXEM 3/90
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014

MULTIPLE PACKAGE SERVICE

**IF YOU ARE
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THE SELF ADHESIVE
MPS COPY HERE**

TERMS AND CONDITIONS

DEFINITIONS

On this Airbill, we, our and us refer to Federal Express Corporation, its employees and agents. You and your refer to the sender, its employees and agents.

AGREEMENT TO TERMS

By giving us your package to deliver, you agree to all the terms on this Airbill and in our current Service Guide, which is available on request. If there is a conflict between the current Service Guide and this Airbill, the Service Guide will control. No one is authorized to alter or modify the terms of our Agreement.

RESPONSIBILITY FOR PACKAGING AND COMPLETING AIRBILL

You are responsible for adequately packaging your goods and for properly filling out this Airbill. Omission of the number of packages and weight per package from this Airbill will result in a billing based on our best estimate of the number of packages received from you and an estimated "default" weight per package, as determined and periodically adjusted by us.

AIR TRANSPORTATION TAX INCLUDED

Our basic rate includes a federal tax required by Internal Revenue Code Section 4271 on the air transportation portion of this service.

LIMITATIONS ON OUR LIABILITY AND LIABILITIES NOT ASSUMED

Our liability for loss or damage to your package is limited to your actual damages or \$100, whichever is less, unless you pay for and declare a higher authorized value. We do not provide cargo liability insurance, but you may pay an additional charge for each additional \$100 of declared value. If you declare a higher value and pay the additional charge, our liability will be the lesser of your declared value or the actual value of your package.

In any event we will not be liable for any damages, whether direct, incidental, special or consequential in excess of the declared value of a shipment, whether or not Federal Express had knowledge that such damages might be incurred including, but not limited to, loss of income or profits.

We won't be liable for your acts or omissions, including but not limited to improper or insufficient packing, securing, marking or addressing, or for the acts or omissions of the recipient or anyone else with an interest in the package. Also, we won't be liable if you or the recipient violates any of the terms of our agreement. We won't be liable for loss of or damage to shipments of cash, currency or other prohibited items.

We won't be liable for loss, damage or delay caused by events we cannot control, including but not limited to acts of God, perils of the air, weather conditions, mechanical delays, acts of public enemies, war, strikes, civil commotions, or acts or omissions of public authorities (including customs and quarantine officials) with actual or apparent authority.

DECLARED VALUE LIMITS

The highest declared value we allow for FedEx Letter and FedEx Pak shipments is \$100. For other shipments, the highest declared value we allow is \$25,000 unless your package contains items of "extraordinary value," in which case the highest declared value we allow is \$500. Items of "extraordinary value," include artwork, jewelry, furs, money, precious metals,

negotiable instruments, and other items listed in our current Service Guide.

If you send more than one package on this Airbill, you may fill in the total declared value for all packages, not to exceed the \$100, \$500 or \$25,000 per package limit described above. (Example: 5 packages can have a total declared value of up to \$125,000.)

If more than one package is shipped on this airbill, our liability for loss or damage will be limited to the actual value of the package(s) lost or damaged (not to exceed the lesser of the total declared value or the per package limits described above). You have the responsibility of proving the actual loss or damage.

FILING A CLAIM

ALL CLAIMS MUST BE MADE BY YOU IN WRITING: You must notify us of your claim within strict time limits. See current Service Guide.

We'll consider your claim filed if you call and notify our Customer Service Department at 800-238-5355 and notify us in writing as soon as possible.

Within 90 days after you notify us of your claim, you must send us all relevant information about it. We are not obligated to act on any claim until you have paid all transportation charges, and you may not deduct the amount of your claim from those charges.

If the recipient accepts your package without noting any damage on the delivery record, we will assume that the package was delivered in good condition. In order for us to process your claim, you must, to the extent possible, make the original shipping cartons and packing available for inspection.

RIGHT TO INSPECT

We may, at our option, open and inspect your packages prior to or after you give them to us to deliver.

NO C.O.D. SERVICES

We don't provide C.O.D. services.

RESPONSIBILITY FOR PAYMENT

Even if you give us different payment instructions, you will always be primarily responsible for all delivery costs, as well as any costs we may incur in either returning your package to you or warehousing it pending disposition.

QUALIFIED ACCEPTANCE

We reserve the right to reject a shipment at any time, when such shipment would be likely to cause damage or delay to other shipments, equipment or personnel, or if the transportation of which is prohibited by law or is in violation of any rules contained in this Airbill or our Service Guide.

MONEY-BACK GUARANTEE

In the event of untimely delivery, Federal Express will at your request and with some limitations, refund or credit all transportation charges. See current Service Guide for further information.