APPENDIX A. COMPONENTS OF FEDERAL LEGISLATION FOR IMPLEMENTING 3PARTY COVENANT

Implementation of the 3Party Covenant requires federal legislation authorizing loan guarantees for qualifying IGCC projects. Consideration must be given to a number of implementation issues in developing legislation to ensure the program meets IGCC deployment objectives with minimal federal budget impact. Meeting deployment objectives will require determining the desired level of investment (in what timeframe), and ensuring that the economic and financial hurdles that have inhibited IGCC commercial deployment to date are adequately addressed.

The outline below describes recommended components of federal legislation to implement the 3Party Covenant. These components are designed to stimulate development of 3,500 MW of IGCC generation with federal loan guarantees of $5 billion. The program is targeted at stimulating deployment of IGCC technology, which is the focus of this paper. This or other incentive programs may be appropriate for IGCC and other advanced coal technologies.

<u>Purpose</u>

Establish a federal loan guarantee program that stimulates deployment of IGCC by reducing cost of capital, apportioning risk, and assisting with pre-development costs in order to:

- Support U.S. energy independence
- Promote homeland security
- Improve coal generation environmental performance
- Increase generation efficiency
- Refuel and revalue billions of dollars of financially distressed and underutilized natural gas combined cycle investments
- Reduce pressure on natural gas prices
- Provide affordable and reliable electricity supplies
- Position the U.S. as a global leader in advanced coal generation technology
- Minimize the burden to the federal budget

<u>Scope</u>

- $500 million appropriations to score up to $5 billion of federal loan guarantees for 3,500 MWs of base load capacity:
    - o $450 million for scoring loan guarantees
    - o $50 million revolving fund for pre-development engineering loans
    - o Loan guarantees may be committed for a period of 10 years beginning with the first fiscal year the program is funded.

- Program shall be implemented through an accelerated rulemaking process to be completed within 12 months of enactment
- Program shall authorize the collection of application or other fees to cover administrative costs as well as insurance fees to the extent such fees are determined to be appropriate by the Secretary

Loan Guarantees
- Up to 80% of total plant Investment
- 30-year term, non-recourse, backed by full faith and credit of U.S. Government
- Owner contributes 20% equity investment

Qualifying Projects
- An IGCC or other coal-fueled power plant technology with the following performance characteristics:
    - Coal accounts for at least 75% of fuel heat input
    - In the case of IGCC, combustion turbine operates on syngas as primary fuel (natural gas or diesel may serve as an emergency back-up fuel only)
    - Design heat rate of 8,700 btu/kWh (HHV) or lower
    - New power plant, repowering of an existing coal power plant, or refueling of an existing natural gas combined cycle power plant
- Emissions Performance:
    - 99% sulfur reduction with SO_2 emission not to exceed 0.04 lb/mmBtu
    - NOx emissions not to exceed 0.025 lb/mmBtu (5 ppm)
    - Particulate emissions from stack not to exceed 0.01 lb/mmBtu
    - 95% mercury emissions control
- Determination by DOE that the technology provides a technical pathway for CO_2 separation and capture and for the co-production of hydrogen slip-streams.
- To minimize federal budget scoring, qualifying projects shall have:
    - 3Party Covenant assured revenue stream through state PUC or other regulatory body providing upfront and ongoing regulatory determinations of prudence of project costs and approvals of pass-through of project costs (reflecting ongoing inclusion of approved capital investments in rate base and inclusion of approved operating costs in the cost of service, or reflecting purchased power costs incurred under a power purchase agreement) under federal and state enabling laws ("Regulatory Determinations"); or
    - Comparable credit (and budget scoring) as that provided by 3Party Covenant Regulatory Determinations, which might be created through insurance, industrial guarantees, or other credit enhancements.
- Projects shall include EPC contractor performance and delivery guarantees (full wrap) for project construction.

- Initial financing shall include a Construction and Operating Reserve Fund of 10 percent of Capital Costs to cover revenue shortfall from startup operations, unscheduled maintenance, etc., and provide Line of Credit for additional draw of up to 15 percent of Capital Costs with an additional minimum matching equity contribution of 20 percent of the amount drawn.

- Secretary shall issue guarantees only for projects with budget scoring that does not exceed 10% of loan principal.
- Secretary shall develop criteria for issuing loan guarantee reservations (commitments prior to closing) for projects that have demonstrated feasibility and meet program qualifications

Pre-development Engineering Loans
- Non-recourse, interest-free loans shall be available for 75% of the cost of developing initial engineering and feasibility evaluations of potential projects
- Developer will be required to provide 25% cash match
- Loans not to exceed $5 million dollars
- Loans to be repaid out of long-term project loan disbursements and placed into a revolving loan fund
- Secretary shall develop criteria for selecting projects to receive Pre-development Engineering Loans, taking into account project timing, feasibility and ability to meet Project Selection Criteria (below)

Project Selection
- Secretary shall establish Project Selection Criteria, including consideration of the following elements:
  - Utilization of diverse coal supplies and types
  - Competitive electricity prices
  - Geographic diversity
  - Project feasibility
  - Financial strength of project
  - Environmental performance

APPENDIX B: LEVELIZED CARRYING CHARGE CALCULATIONS

Levelized Carrying Charge EPRI Methodology: Traditional Utility Financing of Coal Plant (MACRS for depreciation)

inflation rate	0.02
Nominal cost of debt	0.065
Real cost of debt	0.04411765
Nominal cost of equity	0.186
Real cost of equity	0.1627451
debt fraction	0.55
equity fraction	0.45
federal/state income tax rate	0.382
Weighted pretax cost of capital	0.0975
Weighted after tax cost of capital	0.08823088
Discount rate	0.08823088
Construction period (years)	4
Number of equal invest payments	4
PTI rate	0.02
Book life (years)	30
Tax life (years)	20
CRF for levelizing CCR	0.09581305
Y	0.98039216
Z	1.08823088
TCE/TPI	0.85150267
TPI/TPC	1.14030272
Owner cost as fraction of TPI	0.08769601
Owner cost as fraction of TPC	0.1
Modified Accelerated Capital Recovery System (MACRS)	

Year of operation	PV factor	Tax Deprec	Book Deprec	Deferred income tx	Remaining book value	Return on equity	Return on debt	Taxes paid	PTI	CCR	PV of CCR
1	0.918923	0.065625	0.033333	0.01151112	1	0.079658	0.026393	0.039104	0.01703	0.207029	0.190244
2	0.844419	0.070078	0.033333	0.01309849	0.966667	0.077579	0.025584	0.036232	0.01703	0.202857	0.171296
3	0.775956	0.064822	0.033333	0.01122487	0.933333	0.0755	0.024775	0.036821	0.01703	0.198684	0.15417
4	0.713043	0.059961	0.033333	0.00949205	0.9	0.073422	0.023966	0.037268	0.01703	0.194512	0.138695
5	0.655232	0.055464	0.033333	0.00788899	0.866667	0.071343	0.023157	0.037587	0.01703	0.190339	0.124716
6	0.602107	0.051304	0.033333	0.00640606	0.833333	0.069264	0.022349	0.037785	0.01703	0.186167	0.112092
7	0.55329	0.047456	0.033333	0.00503435	0.8	0.067186	0.02154	0.037872	0.01703	0.181995	0.100696
8	0.508431	0.044594	0.033333	0.00401413	0.766667	0.065107	0.020731	0.037607	0.01703	0.177822	0.09041
9	0.467208	0.044594	0.033333	0.00401413	0.733333	0.063028	0.019922	0.036322	0.01703	0.17365	0.081131
10	0.429328	0.044594	0.033333	0.00401413	0.7	0.06095	0.019113	0.035037	0.01703	0.169478	0.072762
11	0.39452	0.044594	0.033333	0.00401413	0.666667	0.058871	0.018304	0.033752	0.01703	0.165305	0.065216
12	0.362533	0.044594	0.033333	0.00401413	0.633333	0.056792	0.017496	0.032467	0.01703	0.161133	0.058416
13	0.33314	0.044594	0.033333	0.00401413	0.6	0.054714	0.016687	0.031183	0.01703	0.15696	0.05229
14	0.30613	0.044594	0.033333	0.00401413	0.566667	0.052635	0.015878	0.029898	0.01703	0.152788	0.046773
15	0.281309	0.044594	0.033333	0.00401413	0.533333	0.050556	0.015069	0.028613	0.01703	0.148616	0.041807
16	0.258502	0.044594	0.033333	0.00401413	0.5	0.048478	0.01426	0.027328	0.01703	0.144443	0.037339
17	0.237543	0.044594	0.033333	0.00401413	0.466667	0.046399	0.013451	0.026043	0.01703	0.140271	0.03332
18	0.218284	0.044594	0.033333	0.00401413	0.433333	0.04432	0.012643	0.024758	0.01703	0.136099	0.029708
19	0.200586	0.044594	0.033333	0.00401413	0.4	0.042242	0.011834	0.023473	0.01703	0.131926	0.026463
20	0.184323	0.005574	0.033333	-0.0098955	0.366667	0.040163	0.011025	0.036098	0.01703	0.127754	0.023548
21	0.169378	0	0.033333	-0.0118824	0.333333	0.038084	0.010216	0.0368	0.01703	0.123582	0.020932
22	0.155646	0	0.033333	-0.0118824	0.3	0.036006	0.009407	0.035515	0.01703	0.119409	0.018586
23	0.143026	0	0.033333	-0.0118824	0.266667	0.033927	0.008599	0.03423	0.01703	0.115237	0.016482
24	0.13143	0	0.033333	-0.0118824	0.233333	0.031848	0.00779	0.032945	0.01703	0.111064	0.014597
25	0.120774	0	0.033333	-0.0118824	0.2	0.02977	0.006981	0.031661	0.01703	0.106892	0.01291
26	0.110982	0	0.033333	-0.0118824	0.166667	0.027691	0.006172	0.030376	0.01703	0.10272	0.0114
27	0.101984	0	0.033333	-0.0118824	0.133333	0.025612	0.005363	0.029091	0.01703	0.098547	0.01005
28	0.093715	0	0.033333	-0.0118824	0.1	0.023534	0.004554	0.027806	0.01703	0.094375	0.008844
29	0.086117	0	0.033333	-0.0118824	0.066667	0.021455	0.003746	0.026521	0.01703	0.090203	0.007768
30	0.079135	0	0.033333	-0.0118824	0.033333	0.019376	0.002937	0.025236	0.01703	0.08603	0.006808

Present value of CCRn   1.779469

Levelized Carrying Charge   **0.170496**

Levelized Carrying Charge EPRI Methodology: 3Party Covenant Financing (MACRS for depreciation)

inflation rate	0.02
Nominal cost of debt	0.055
Real cost of debt	0.03431373
Nominal cost of equity	0.186
Real cost of equity	0.1627451
debt fraction	0.8
equity fraction	0.2
federal/state income tax rate	0.382
Weighted pretax cost of capital	0.06
Weighted after tax cost of capital	0.04951373
Discount rate	0.04951373
Construction period (years)	1
Number of equal invest payments	1
PTI rate	0.02
Book life (years)	30
Tax life (years)	20
CRF for levelizing CCR	0.06469129
Y	0.98039216
Z	1.04951373
TCE/TPI	1
TPI/TPC	1
Owner cost as fraction of TPI	0.2
Owner cost as fraction of TPC	0.2
Modified Accelerated Capital Recovery System (MACRS)	

Year of operation	PV factor	Tax Deprec	Book Deprec	Deferred income tx	Remaining book value	Return on equity	Return on debt	Taxes paid	PTI	CCR	PV of CCR
1	0.952822	0.065625	0.033333	0.01233542	1	0.039059	0.032941	0.011808	0.02	0.149476	0.142425
2	0.90787	0.070078	0.033333	0.01403646	0.966667	0.037974	0.032026	0.009436	0.02	0.146806	0.133281
3	0.865039	0.064822	0.033333	0.01202867	0.933333	0.036889	0.031111	0.010773	0.02	0.144135	0.124683
4	0.824228	0.059961	0.033333	0.01017177	0.9	0.035804	0.030196	0.011959	0.02	0.141465	0.116599
5	0.785343	0.055464	0.033333	0.00845391	0.866667	0.034719	0.029281	0.013007	0.02	0.138794	0.109001
6	0.748292	0.051304	0.033333	0.00686479	0.833333	0.033634	0.028366	0.013925	0.02	0.136123	0.10186
7	0.71299	0.047456	0.033333	0.00539486	0.8	0.032549	0.027451	0.014724	0.02	0.133453	0.09515
8	0.679352	0.044594	0.033333	0.00430157	0.766667	0.031464	0.026536	0.015147	0.02	0.130782	0.088847
9	0.647302	0.044594	0.033333	0.00430157	0.733333	0.030379	0.025621	0.014476	0.02	0.128111	0.082927
10	0.616764	0.044594	0.033333	0.00430157	0.7	0.029294	0.024706	0.013806	0.02	0.125441	0.077367
11	0.587666	0.044594	0.033333	0.00430157	0.666667	0.028209	0.023791	0.013135	0.02	0.12277	0.072148
12	0.559941	0.044594	0.033333	0.00430157	0.633333	0.027124	0.022876	0.012465	0.02	0.120099	0.067249
13	0.533525	0.044594	0.033333	0.00430157	0.6	0.026039	0.021961	0.011794	0.02	0.117429	0.062651
14	0.508354	0.044594	0.033333	0.00430157	0.566667	0.024954	0.021046	0.011123	0.02	0.114758	0.058338
15	0.484371	0.044594	0.033333	0.00430157	0.533333	0.023869	0.020131	0.010453	0.02	0.112087	0.054292
16	0.461519	0.044594	0.033333	0.00430157	0.5	0.022784	0.019216	0.009782	0.02	0.109417	0.050498
17	0.439746	0.044594	0.033333	0.00430157	0.466667	0.021699	0.018301	0.009111	0.02	0.106746	0.046941
18	0.419	0.044594	0.033333	0.00430157	0.433333	0.020614	0.017386	0.008441	0.02	0.104076	0.043608
19	0.399232	0.044594	0.033333	0.00430157	0.4	0.019529	0.016471	0.00777	0.02	0.101405	0.040484
20	0.380397	0.005574	0.033333	-0.0106041	0.366667	0.018444	0.015556	0.022005	0.02	0.098734	0.037558
21	0.362451	0	0.033333	-0.0127333	0.333333	0.017359	0.014641	0.023464	0.02	0.096064	0.034818
22	0.345351	0	0.033333	-0.0127333	0.3	0.016275	0.013725	0.022793	0.02	0.093393	0.032253
23	0.329059	0	0.033333	-0.0127333	0.266667	0.01519	0.01281	0.022122	0.02	0.090722	0.029853
24	0.313534	0	0.033333	-0.0127333	0.233333	0.014105	0.011895	0.021452	0.02	0.088052	0.027607
25	0.298742	0	0.033333	-0.0127333	0.2	0.01302	0.01098	0.020781	0.02	0.085381	0.025507
26	0.284648	0	0.033333	-0.0127333	0.166667	0.011935	0.010065	0.02011	0.02	0.08271	0.023543
27	0.271219	0	0.033333	-0.0127333	0.133333	0.01085	0.00915	0.01944	0.02	0.08004	0.021708
28	0.258424	0	0.033333	-0.0127333	0.1	0.009765	0.008235	0.018769	0.02	0.077369	0.019994
29	0.246232	0	0.033333	-0.0127333	0.066667	0.00868	0.00732	0.018098	0.02	0.074698	0.018393
30	0.234615	0	0.033333	-0.0127333	0.033333	0.007595	0.006405	0.017428	0.02	0.072028	0.016899

Present value of CCRn	1.856482
Levelized CCR	**0.120098**

Revenue Requirements for Regulated Electric Utilities
(EPRI methodology)

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15 April 2004

Derivation of Carrying Charge Formula

The following is based on the EPRI *Technical Assessment Guide* (1993), for the cases where the investment tax credit ITC = 0. In any year the revenue requirement is

$R = FOM + CR + RE + RD + TP + PTI = CC + FOM$, where

R = revenue

CC = carrying charge

FOM = fuel and operation and maintenance (O&M) costs

CR = capital recovery

RE = return on equity

RD = return on debt (deductible for tax purposes)

TP = federal and state income taxes paid = $t*(R - FOM - RD - PTI - DT)$

PTI = property taxes and insurance

t = income tax rate (assumed to be 0.382)

DT = depreciation for tax purposes [generally different from book depreciation (DB)]

Thus:

$R = FOM + CR + RE + RD + PTI + t*(R - FOM - PTI - RD - DT)$

Simple algebraic manipulations yield:

$(1 - t)*(R - FOM - RD - PTI) = RE + CR - t*DT$,

$R = FOM + RD + PTI + (RE + CR)/(1 - t) - [t/(1 - t)]*DT$,

$R - FOM - RD - PTI = (RE + CR)/(1 - t) - [t/(1 - t)]*DT$,

$TP = t*[(RE + CR)/(1 - t) - t/(1 - t)*DT - DT] = [t/(1 - t)]*(RE + CR - DT)$,

so that the carrying charge is:

$$CC = [1/(1 - t)]*(RE + CR) + RD - t*DT/(1 - t) + PTI$$

Alternatively, one can write:

$$CC = CR + RE + RD + TP + PTI \text{ where } TP = [t/(1 - t)]*(RE + CR - DT)$$

Reference year \$ = December of the year prior to start-up on following January 1

N = construction time (years)

BL = book life (years)

TL = tax life (years)

Costs assumed to be incurred at end of year

TPC = total plant cost (overnight construction cost) = $SUM(E_1:E_N)$

E_n = construction cost incurred in year n, expressed in December reference year \$

TCE = total cash expended in mixed year \$ = $SUM[E_1/(1+i)^{N-1}:E_N]$ [= TPC if no inflation (i = 0)]

i = inflation rate

TPI = total plant investment in December reference year \$ = $SUM\{E_1[(1+c)/(1+i)]^{N-1}:E_N\}$

AFUDC = allowance for funds used during construction = TPI – TCE

$= \text{SUM}\{E_1[(1+c)/(1+i)]^{N-1} - E_1/(1+i)^{N-1}: E_N - E_N\}$

DF = debt share of investment (DF of AFUDC is tax deductible)

EF = equity share of investment (EF of AFUDC is non-depreciating for book/tax purposes

d = cost of debt

e = cost of equity

c = weighted cost of capital = DF*d + EF*e

IGD = investment gross depreciable = TCE + DF*AFUDC

IND = investment non-depreciable = owner costs + AFUDC*EF

Owner costs (prepaid royalties, startup costs, inventory capital, initial costs for catalysts and chemicals, and land) are treated as a non-depreciating asset

IT = investment total = IGD + IND = TCE + AFUDC + owner costs

= TPI + owner costs [= IN (investment net) if ITC = 0)]

PTI = property taxes and insurance = pti*TCE

pti = PTI rate (assumed to be 0.02—note that with zero inflation, pti multiplies TPC, not TPI)

DB = book depreciation = IGD/BL

Calculation of individual components

CR (capital recovery) = (IGD)/BL + EF*AFUDC/BL (equity AFUDC recovery)

      + DIT (deferred income tax)

CR = (TCE + DF*AFUDC)/BL + EF*AFUDC/BL + DIT

CR = (TCE + AFUDC)/BL + DIT

CR = TPI/BL + DIT = DB + DIT

Book Depreciation

DB = book depreciation = TPI/BL

$$\mathbf{DB/TPI = 1/BL}$$

Deferred Income Taxes

$\text{DIT}_n = t*(\text{TDR}_n - 1/BL)*\text{IGD} = t*(\text{TDR}_n - 1/BL)*(\text{TCE} + \text{DF}*\text{AFUDC})$

$= t*(\text{TDR}_n - 1/BL)*[\text{TCE} + \text{DF}*(\text{TPI} - \text{TCE})]$

TDR_n = Tax depreciation rate for year n

$\text{DIT}_n/\text{TPI} = t*(\text{TDR}_n - 1/BL)*[\text{TCE}/\text{TPI} + \text{DF}*(1 - \text{TCE}/\text{TPI})]$

$$\mathbf{DIT_n/TPI = t*(TDR_n - 1/BL)*[DF + TCE/TPI*(1 - DF)]}$$

Return on Equity

$\text{RE}_n = e*[\text{equity balance in year n (\underline{note}: EF*AFUDC does not depreciate)}]$

= e*EF*{owner costs + AFUDC + TCE*[1 – (n-1)/BL]}

= e*EF*{owner costs + TPI - TCE + TCE*[1 – (n-1)/BL]}

= e*EF*[owner costs + TPI – TCE*(n-1)/BL]

$$\mathbf{RE_n/TPI = e*EF*[(owner\ costs/TPI) + 1 - (TCE/TPI)*(n-1)/BL]}$$

Return on Debt

$RD_n = d*$(debt balance in year n)

$= d*DF*\{$owner costs $+ (TCE + AFUDC)*[1 - (n-1)/BL]\}$

$= d*DF*\{$owner costs $+ (TPI)*[1 - (n-1)/BL]\}$

$$\mathbf{RD_n/TPI = d*DF*[(owner\ costs)/TPI + 1 - (n-1)/BL]}$$

Income Taxes Paid

$TP_n = [t/(1–t)]*\{e*EF*[$owner costs $+ TPI – TCE*(n-1)/BL] + TPI/BL$
$\qquad + [TCE+DF*(TPI– TCE)]*[t*(TDR_n–1/BL) – TDR_n]\}$,

$$\mathbf{TP_n/TPI = [t/(1–t)]*\{e*EF*[(owner\ cost)/TPI + \ 1 – TCE/TPI*(n-1)/BL] + 1/BL}$$
$$\mathbf{+ [TCE/TPI +DF*(1– TCE/TPI)]*[t*(TDR_n–1/BL) – TDR_n]\}}$$

Property Taxes and Insurance

$PTI = $ property taxes and insurance $= pti*TCE$

$$\mathbf{PTI/TPI = pti*(TCE/TPI)}$$

Simplified Representation of TCE/TPI

A simplification for TCE/TPI arises if it is assumed that there are N years of construction and M equal capital cost payments during this period, with the last payment made at the time of plant startup. Thus:

$$E_i = TPC/M, \text{ and}$$

$TPI = (TPC/M)*(1 + Z + Z^2 + \ldots + Z^{M-1}) = (TPC/M)*(Z^M - 1)/(Z – 1)$ where $Z = [(1 + c)/(1 + i)]^{N/M}$

$$TPI/TPC = (Z^M - 1)/[M*(Z – 1)]$$

Likewise
$$TCE = (TPC/M) = (TPC/M)*(Y^M - 1)/(Y – 1) \text{ where } Y = [1/(1 + i)]^{N/M}$$
so that

$$\mathbf{TCE/TPI = [(Y^M - 1)/(Y – 1)]/[(Z^M - 1)/(Z – 1)]}$$

Converting Annual Carrying Charge Rates into a Levelized Carrying Charge Rate

To convert the annual carrying charge rates:

CCR_n
$= 1/BL + \ t*(TDR_n – 1/BL)*[DF + TCE/TPI*(1 – DF)]$
$+ e*EF*[($owner costs$/TPI) + 1 – (TCE/TPI)*(n-1)/BL]$
$+ d*DF*[($owner costs$)/TPI + 1 – (n-1)/BL]\}$
$+ [t/(1–t)]*\{e*EF*[($owner costs$)/TPI + 1 – TCE/TPI*(n-1)/BL] + 1/BL$
$+ [TCE/TPI +DF*(1– TCE/TPI)]*[t*(TDR_n–1/BL) - TDR_n]\}$
$+ pti*(TCE/TPI)$

into a levelized capital charge rate LCCR (the multiplier of TPI), the present value at the time of plant startup of all CCR_n is summed over all years up through $n = BL$, and the resultant $PV\{CCR_n\}$ is converted into LCCR by multiplying by the capital recovery factor calculated for the discount rate dr and term BL:

$$\textbf{LCCR = CRF (dr, BL)* PV\{CCR_n\}, where CRF (dr, BL) = dr/[1 - (1 + dr)^{-BL}]}$$

The discount used in this calculation is assumed to be the after-tax weighted cost of capital:

$$\textbf{dr = DF*d*(1 - t) + EF*e}$$