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00969969 CAB Accession Number: 802407952
Study of the use of refuse slag concrete.
Original Title: Ondersoek naar de toepassing van afvalverbrandingsslakken-beton.
Publication Year: 1980
CAB Abstracts 1972-2001/Nov (c) 2001 CAB International
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2/6/8 (Item 3 from file: 50)
00313886 CAB Accession Number: 751915099
Effect of increasing amounts of town- refuse slag on yields and trace-element contents of wheat.
Publication Year: 1973
CAB Abstracts 1972-2001/Nov (c) 2001 CAB International
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2/6/10 (Item 5 from file: 50)
00233560 CAB Accession Number: 750330246
Preliminary trials with refuse slag as a material for the drainagelayer in turf sports grounds.
Original Title: Vorversuche mit Mullschlacke als Dranschicht-Baustoff fur Rasensportflachen.
Publication Year: 1974
CAB Abstracts 1972-2001/Nov (c) 2001 CAB International
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2/6/12 (Item 1 from file: 203)
00921338
Plant uptake of heavy metals (pots and mini plots), D: Trace metals in solid waste materials, plant availabilities in soil mixtures at varying pH, pot experiments [sandy-loam, green house, Italian ryegrass, sludge, garbage , compost, sludge-pyrolysis slag , incineration slag , incineration fly ash, manganese, copper, zinc, nickel, lead, cadmium, pH] (Spormetaloptag i planter (kar- og rammeforsoeg), D: Spormetaller i affaldsmaterialer, plantetilgaengelighed ved jordindblanding ved varierende pH; karforsoeg)
1981
[Agricultural use of sewage, 3: Report sections] (Slammets jordbrugsanvendelse, 3: Delrapporter)
AGRIS 1974-2001/Oct Dist by NAL, Intl Copr. All rights reserved

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2/6/14 (Item 1 from file: 8)
05776764
Title: Fundamental tests on application of MSW direct melting slag as soil improvement material
Publication Year: 2000
Ei Compendex(R) 1970-2001/Dec W4 (c) 2001 Engineering Info. Inc.
==
2/6/15 (Item 2 from file: 8)
04918884
Title: Muellschlackenbehandlung in der MVB Hamburg-Borsigstrasse
Title: Refuse incineration slag treatment in the Hamburg-Borsigstrasse refuse incineration plant
Publication Year: 1997
Ei Compendex(R) 1970-2001/Dec W4 (c) 2001 Engineering Info. Inc.
==
2/6/16 (Item 3 from file: 8)
03883223
Title: Mechanische Aufbereitung von Schlacke aus Muellverbrennungsanlagen mit dem Schwerpunkt Schrott
Title: Mechanical processing of refuse incinerator slag with special emphasis on refuse incinerator scrap
Publication Year: 1993
Ei Compendex(R) 1970-2001/Dec W4 (c) 2001 Engineering Info. Inc.
==
2/6/17 (Item 4 from file: 8)
02801727
Title: Beurteilung der Umweltvertraeglichkeit vonMuellverbrennungsschlacken im Strassenbau.
Title: Evaluation of the environmental compatibility of using slag from refuse incineration in road construction.
Publication Year: 1989
Ei Compendex(R) 1970-2001/Dec W4 (c) 2001 Engineering Info. Inc.
==
2/6/18 (Item 5 from file: 8)
00578330
Title: Refuse Slag Melting: Experiences and Expectations.
Title: MUELLSCHLACKENSCHMELZE -- ERFAHRUNGEN, ERWARTUNGEN.
Publication Year: 1976
Ei Compendex(R) 1970-2001/Dec W4 (c) 2001 Engineering Info. Inc.
==
2/6/20 (Item 7 from file: 8)
00242360
Title: Conclusions drawn from operating experience of a refuse slag sintering plant.
Title: Folgerungen aus den Betriebserfahrungen mit einer Muellschlackensinteranlage.
Publication Year: 1971
Ei Compendex(R) 1970-2001/Dec W4 (c) 2001 Engineering Info. Inc.

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Comment No. 25 (cont.) **Issue Code: 07**

unexpected discharge of a hazardous material that threatens the life, health, or safety of citizens or the environment is considered an environmental emergency. More information on the Emergency Response Team can be found on the Internet at http://water.nr.state.ky.us/dow/dwert.htm.

Comment No. 26 **Issue Code: 12**

Vitrified frit produced from the quenching of molten slag from the gasification process is a commercial product, not a waste. The frit from gasifiers operating on a 100 percent coal feed has consistently proven to be nonhazardous under RCRA. Since this project will be using a different feed stream, the final batch of frit should be tested to ensure that it meets all TCLP criteria and is therefore nonhazardous. The vitrified frit consists primarily of ash (99.2 percent by weight) composed of oxides of the following elements silicon (SiO_2), aluminum (Al_20_3), titanium (TiO_2), iron (Fe_20_3), calcium (CaO), magnesium (MgO), potassium (K_2O) and sodium (Na_2O). The frit also consists chloride, fluoride, antimony, arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, lead, manganese, mercury, molybdenum, nickel, silver, thallium, vanadium and zinc. All constituents of the frit are immobilized in a glassy matrix which is resistant to corrosion in the environment. The frit from gasifiers operating on other feed streams is considered nonleachable by EPA standards. Because the slag from the gasification process is in a fused, vitrified state, it rarely fails TCLP for metals. Slag is not a good substrate for binding organic compounds, so it is usually found to be nonhazardous, exhibiting none of the characteristics of hazardous waste. Vitrified frit produced by gasifiers operating on different feed streams passes the more stringent Universal Treatment Standards criteria of the EPA-TCLP analytical method and is nonhazardous. The frit from this facility is also expected to pass the Universal Treatment Standards criteria. Chapter 3 of the EIS has been revised to include a more detailed description of the frit.

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2/6/26     (Item 1 from file: 34)
09513461   Genuine Article#: 412VM   Number of References: 3
Title: Melting and stone production using MSW incinerated ash  (ABSTRACT
AVAILABLE)Publication date: 20010000
SciSearch(R) Cited Ref Sci  1990-2001/Dec W5 (c) 2001 Inst for Sci Info
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2/6/28     (Item 1 from file: 40)
00398899   ENVIROLINE NUMBER: 92-09432
Slag  and  Fly  Ash  from   MSW  Incineration Plants Characterization and
Reuse
Sep 91
Enviroline(R)  1975-2001/Dec
===============================================
2/6/29     (Item 1 from file: 41)
254352   98-09586
Assessment of the long-term behavior of MSW incinerator slag
Pollution Abs  1970-2001/Nov (c) 2001 Cambridge Scientific Abstracts
===============================================
2/6/30     (Item 2 from file: 41)
035545   75-02666
Using  slag  from refuse incinerators as a building material.   Publ.Yr:
1974
Pollution Abs  1970-2001/Nov (c) 2001 Cambridge Scientific Abstracts
===============================================
2/6/31     (Item 1 from file: 51)
00109885   76-02-m0224   SUBFILE: FSTA
Effect of increasing doses of incinerated household  refuse   slag  on
yield and trace element content of wheat)
Einfluss steigender Gaben an Muellschlacke auf die Ertragsbildung und den
Gehald an Spurenelementen im Weizen.
1973
Food Sci.&Tech.Abs  1969-2001/Feb W1 (c) 2001 FSTA IFIS Publishing
===============================================
2/6/32     (Item 1 from file: 63)
00793584      DA
TITLE: HOUSEHOLD- REFUSE  INCINERATION  SLAG  IN ROAD ENGINEERING - THE
FRENCH EXPERIENCE
PUBLICATION DATE: 20000000
DATA SOURCE: Transport Research Laboratory (TRL)
Transport Res(TRIS)  1970-2001/Nov (c) fmt only 2001 Dialog Corp.
===============================================
2/6/33     (Item 2 from file: 63)
00179992      DA
TITLE:  REFUSE  INCINERATION  SLAG  IN ROAD CONSTRUCTION;
AFVALVERBRANDINGSSLAK IN DE WEGENBOUW
PUBLICATION DATE: 19771000
DATA SOURCE: Transport and Road Research Laboratory Institute for Road
Safety Research State Road Laboratory, Netherlands
Transport Res(TRIS)  1970-2001/Nov (c) fmt only 2001 Dialog Corp.
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2/6/34     (Item 1 from file: 65)
03253636   INSIDE CONFERENCE ITEM ID: CN034393904
Household- refuse  incineration  slag  in road engineering -the  French
experience'
CONFERENCE: European conference on mineral planning; Mineral planning in
Europe-2nd (199910)
Inside Conferences  1993-2001/Dec W4 (c) 2001 BLDSC all rts. reserv.
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2/6/35     (Item 2 from file: 65)
02311981   INSIDE CONFERENCE ITEM ID: CN024211210
Processing and utilisation of  slag  from  refuse  incinerators
CONFERENCE:  International mineral processing congress Vol 5; Wastetreatment, recycling
and soil remediation-20th (199709)
Inside Conferences  1993-2001/Dec W4 (c) 2001 BLDSC all rts. reserv.
===============================================
2/6/36     (Item 3 from file: 65)
02090225   INSIDE CONFERENCE ITEM ID: CN021901112
Actual Data Report of Residue and Fly Ash Melting, and  Slag   Recovery in
the  MSW  Incineration Plant
CONFERENCE: ISWA international congress-7th (199610)
Inside Conferences  1993-2001/Dec W4 (c) 2001 BLDSC all rts. reserv.
===============================================
2/6/37     (Item 4 from file: 65)
00721397   INSIDE CONFERENCE ITEM ID: CN007033692
Chlorine, Sulfur, and Soluble  Slag  Extraction with Energy Density
Improvements of a  MSW  Slurry
CONFERENCE: Coal utilization and fuel systems-19th International
technical conference (199403)
Inside Conferences  1993-2001/Dec W4 (c) 2001 BLDSC all rts. reserv.
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2/6/38     (Item 1 from file: 68)
00432246  Environmental Bibliography Number: 2101077
Slag  and fly ash from  MSW  incineration plants characterization and use
PUBLICATION YEAR: 1991
Env.Bib.  1974-2001/Nov (c) 2001 Internl Academy at Santa Barbara
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Comment No. 26 (cont.) **Issue Code: 12**

Variability in the RDF content is dependent on the MSW supply. However, RDF production methods inherently yield fairly uniform and homogenous RDF. Due to the vitreous nature of the frit, there would be no particular variability when a leaching test is conducted regardless of the composition of the feed.

Comment No. 27 **Issue Code: 16**

DOE believes that the Kentucky Pioneer IGCC Demonstration Project EIS adequately analyzes the full scope of environmental impacts from the proposed project. Chapter 3 of the EIS has been modified to provide more detail on the gasification process, including the production of the vitreous frit.

Comment No. 28 **Issue Code: 13**

The intent of the project is not to lower the costs of waste disposal in certain areas but rather to demonstrate this particular technology that has the potential to enhance the economics of coal utilization and lower the emissions output of a totally coal-based system. No risks to the economic health of Kentucky have been identified. All risks to the physical health of the area are identified in the EIS. Local benefits are discussed in Section 5.3, Socioeconomics. The relatively small amounts and generally dispersed nature of MSW in Kentucky does not economically support exclusive utilization of Kentucky-generated MSW to produce RDF supplies. Importing RDF from a densely populated metropolitan area is more economically viable in order to supply the necessary amount of RDF required to operate the plant.

Comment No. 29 **Issue Code: 12**

The project produces primarily vitrified frit which is considered a commercial product, not a waste stream. The frit from gasifiers operating on a 100 percent coal feed has consistently proven to be nonhazardous under RCRA. Since this project will be using a different

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2/6/39     (Item 1 from file: 73)
03992928     EMBASE No: 1989161924
Evaluation of the environmental compatibility of using  slag  from
refuse  incineration in road construction
BEURTEILUNG DER UMWELTVERTRAGLICHKEIT VON MULLVERBRENNUNGSSCHLACKEN IM
STRASSENBAU
1989
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/40     (Item 2 from file: 73)
03804900     EMBASE No: 1988254340
Effect of boiler ash on quality of  slag  from  refuse  combustion
EINFLUSS DER KESSELASCHE AUF DIE QUALITAT VON MULLVERBRENNUNGSSCHLACKE
1988
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/41     (Item 3 from file: 73)
02659723     EMBASE No: 1984128682
Slag  and fluegas of  refuse  incineration
1984
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/42     (Item 4 from file: 73)
02633069     EMBASE No: 1984152027
Slag  and fluegas of  refuse  incineration plants
1984
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/43     (Item 5 from file: 73)
02619833     EMBASE No: 1984188791
Slag  and stack ash from  refuse  burning installations
1984
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/44     (Item 6 from file: 73)
01618842     EMBASE No: 1980176512
Method for preparation of auxiliary building material from  slag  and ash
from  refuse  burning installations
VERFAHREN ZUR HERSTELLUNG EINES ZUSCHLAGSTOFFES FUR BAUMATERIALIEN AUS
ABFALLSCHLACKE UND FILTERASCHE AUS MULLVERBRENNUNGSANLAGEN
1980EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
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2/6/46     (Item 8 from file: 73)
00997764     EMBASE No: 1978126091
Slag  from  refuse  burning installations used in roadmaking
1977
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/47     (Item 9 from file: 73)
00338014     EMBASE No: 1975110372
Preliminary trials of  refuse   slag  as drainage layer construction
material for turfed sport felds
VORVERSUCHE MIT MULLSCHLACKE ALS DRANSCHICHT BAUSTOFF FUR
RASENSPORTFLACHEN
1974
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/48     (Item 10 from file: 73)
00118950     EMBASE No: 1974109052
Influence of increasing amounts of  refuse   slag  on yield of wheat and
its content of trace elements
EINFLUSS STEIGENDER GABEN AN MULLSCHLACKE AUF DIE ERTRAGSBILDUNG UND DEN
GEHALT AN SPURENELEMENTEN IM WEIZEN
1973
EMBASE  1974-2001/Dec W4 (c) 2001 Elsevier Science B.V.
==============================================
2/6/49     (Item 1 from file: 77)
4619049
Supplier Accession Number: 01-07421           V29N06
Metal release from MSW molten slag in single batch leaching test
Conference Papers Index  1973-2001/Nov (c) 2001 Cambridge Sci Abs
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2/6/51     (Item 1 from file: 94)
04870860   JICST ACCESSION NUMBER: 01A0500927  FILE SEGMENT: JICST-E
Utilization of  Slag  Produced by Pyrolysis Gasification and Melting
Process of  MSW . , 2001
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/52     (Item 2 from file: 94)
04613997   JICST ACCESSION NUMBER: 00A0211677  FILE SEGMENT: JICST-E
Ground Improvement. The Fundamental Tests on Application of  MSW  Direct
Melting  Slag  as Soil Improvement Material., 2000
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/53     (Item 3 from file: 94)
04434305   JICST ACCESSION NUMBER: 00A0013173  FILE SEGMENT: JICST-E
Application of melt  slag  from  garbage  incinerated ash to fine aggregate
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Comment No. 29 (cont.) **Issue Code: 12**

feed stream, the final batch of frit should be tested to ensure that it meets all TCLP criteria and is therefore nonhazardous. Waste generated at the proposed facility that would be landfilled in the State of Kentucky would be solid waste. It is difficult to determine whether waste from this project would drive up the cost of landfilling. Landfill cost increases are dependent on a number of factors, not just the waste generated from this proposed facility. Analysis of east coast waste is beyond the scope of this EIS.

Comment No. 30 **Issue Code: 11**

Heavy metals emissions from the gas turbine operation would be less than 28.3 grams (1 ounce) per year. Total heavy metal deposition in areas downwind of the project would be much less than 1.1 kilograms per hectare (1 pound per acre) accumulated over 20 years. The maximum air pollutant increase associated with emissions from the proposed project would produce no significant short- or long-term air quality impacts and health risks are expected to be minor. Air emissions from the proposed project would be regulated by the State of Kentucky. The air quality permit for the proposed project requires continuous emission monitoring for criteria pollutants and annual emissions testing for cadmium, lead, mercury, hydrogen chloride, and dioxins/furans. Noncompliance with permitted emission levels would result in a plant shutdown.

Comment No. 31 **Issue Code: 02**

The water used for the plant and any aqueous waste stream generated by the project would be in compliance with federal, state, and local guidelines and ordinances. The presence of the facility should have no impact on future economic growth in Lexington, Clark County, or Kentucky. No burdens to the economic health of the region as a result of this project have been identified. According to the *Cumulative Assessment of the Environmental Impacts Caused by Kentucky Electric Generating Units* prepared by the Kentucky Natural Resources and

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for concrete and solidification material for cement., 1999
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/54     (Item 4 from file: 94)
04434304   JICST ACCESSION NUMBER: 00A0013172  FILE SEGMENT: JICST-E
Utilization of melt  slag  (crystallization  slag )from  garbage
incinerated ash to coarse aggregate for concrete., 1999
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
=============================================
2/6/55     (Item 5 from file: 94)
04434298   JICST ACCESSION NUMBER: 00A0013166  FILE SEGMENT: JICST-E
Effective utilization of  slag  made by thermal decomposition and melting
process from the  refuse . Part 1., 1999
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
=============================================
2/6/57     (Item 7 from file: 94)
04292933   JICST ACCESSION NUMBER: 99A0871943  FILE SEGMENT: JICST-E
The experimental examination on the utilization of the  garbage
incineration ash liquid  slag., 1999
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/58     (Item 8 from file: 94)
04258401   JICST ACCESSION NUMBER: 99A0852498  FILE SEGMENT: JICST-E
Utilization of Melted  Slag  of  MSW  for Asphalt Mixture., 1999
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/59     (Item 9 from file: 94)
04236453   JICST ACCESSION NUMBER: 99A0814872  FILE SEGMENT: JICST-E
Stady on effective utilization of liquid  slag  from fly ash in  garbage
incinerator., 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/60     (Item 10 from file: 94)
04193265   JICST ACCESSION NUMBER: 99A0730572  FILE SEGMENT: JICST-E
Development of Technology for Effective Utilization of  Refuse
Incineration Ash and Melting  Slag . , 1999
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/62     (Item 12 from file: 94)
04188843   JICST ACCESSION NUMBER: 99A0588879  FILE SEGMENT: JICST-E
Trial manufacture of concrete secondary product using  refuse  liquid  slag
fine aggregate., 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
=============================================
2/6/63     (Item 13 from file: 94)
04150439   JICST ACCESSION NUMBER: 99A0600616  FILE SEGMENT: JICST-E
Material property of sintered  garbage   slag  fine aggregate of different
production method., 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
=============================================
2/6/64     (Item 14 from file: 94)
04150429   JICST ACCESSION NUMBER: 99A0600605  FILE SEGMENT: JICST-E
Possibility of utilization of sintered  garbage   slag  fine powder as
alternative cement material., 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/65     (Item 15 from file: 94)
04026340   JICST ACCESSION NUMBER: 99A0378178  FILE SEGMENT: JICST-ETechnology
development in the Ministry of Construction Technology Office
114.  On the basic research and test on the possibility of the reuse as
a civil engineering material of the melting solidification ( the
non-industrial wastes  refuse  melting  slag  )  The Touhoku Technology
Office., 1999
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/66     (Item 16 from file: 94)
03976483   JICST ACCESSION NUMBER: 99A0271560  FILE SEGMENT: JICST-E
Manufacturing of glass and glass ceramics from sludge  slag  and  garbage
-incinerated ash  1995 - 1997  (Ministry of Education S)., 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/67     (Item 17 from file: 94)
03907441   JICST ACCESSION NUMBER: 99A0195152  FILE SEGMENT: JICST-E
The Variance in the Physical Properties of  MSW  Incineration Ash &  Slag .
, 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/69     (Item 19 from file: 94)
03857283   JICST ACCESSION NUMBER: 99A0070883  FILE SEGMENT: PreJICST-E
Technology of strengthening  garbage  incineration fly ash molten  slag .
, 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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2/6/70     (Item 20 from file: 94)
03792718   JICST ACCESSION NUMBER: 98A0990764  FILE SEGMENT: JICST-E
Study on  Refuse  Incineration Ash  Slag  Aggregate Concrete., 1998
JICST-EPlus  1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
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Comment No. 32 **Issue Code: 14**

Environmental Protection Cabinet, further electric generation capacity often facilitates the development of the area economy. Under the 50-50 co-feed ratio, the Kentucky Pioneer IGCC Demonstration Project would require the use of approximately 2,268 metric tons (2,500 tons) of high-sulfur coal per day. The project would fulfill this need solely through Kentucky coal.

Comment No. 33 **Issue Code: 21**

Because of DOE's limited role of providing cost-shared funding for the proposed Kentucky Pioneer IGCC Demonstration Project, alternative sites were not considered. KPE selected the existing J.K. Smith Site because the costs would be much higher and the environmental impacts would likely be greater if an undisturbed area was chosen.

Comment No. 34 **Issue Code: 22**

Before any federal funds are obligated, KPE will have to provide proof of finances for construction and operation of the project.

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2/6/71 (Item 21 from file: 94)
03256817 JICST ACCESSION NUMBER: 98A0104167 FILE SEGMENT: PreJICST-E
Utilization of liquid slag of incinerated ash from the municipal refuse
to the road sub-base. , 1997
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/72 (Item 22 from file: 94)
03252627 JICST ACCESSION NUMBER: 98A0081040 FILE SEGMENT: PreJICST-E
A few consideration on the application of the surface melting style
garbage incineration ash slag to fine aggregate for concrete. ,
1997
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/73 (Item 23 from file: 94)
03109521 JICST ACCESSION NUMBER: 97A0196193 FILE SEGMENT: JICST-E
Environment and waste processing, and electric heating. Melting of plasma
type garbage incineration ash and resource recycling of slag . ,
1997
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/74 (Item 24 from file: 94)
02853686 JICST ACCESSION NUMBER: 97A0164865 FILE SEGMENT: PreJICST-E
A study on stabilization of refuse incineration residue molten slag .
, 1996
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/75 (Item 25 from file: 94)
02841414 JICST ACCESSION NUMBER: 97A0070899 FILE SEGMENT: PreJICST-E
Application of garbage incineration ash fused slag to asphalt concrete.
, 1995JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/76 (Item 26 from file: 94)
02753809 JICST ACCESSION NUMBER: 96A0347617 FILE SEGMENT: JICST-E
Practice of environmental countertechnologies. Recycling technology of
garbage incineration ash molten slag . , 1996
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/77 (Item 27 from file: 94)
02725770 JICST ACCESSION NUMBER: 96A0291249 FILE SEGMENT: JICST-E
Utilization of garbage incinerated ash liquid slag to asphalt mixture.
, 1996
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/78 (Item 28 from file: 94)
02663597 JICST ACCESSION NUMBER: 96A0060040 FILE SEGMENT: JICST-E
Resource recycling of slag by plasma-type garbage incineration ash
fusion furnace. , 1995
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/79 (Item 29 from file: 94)
02628384 JICST ACCESSION NUMBER: 95A0851395 FILE SEGMENT: JICST-E
Study of Recycling Ash of Burnt Refuse (Part 3). Application of Slag
Result from Melting Ash of Burnt Refuse for Ceramics Products., 1995
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/80 (Item 30 from file: 94)
02577671 JICST ACCESSION NUMBER: 95A0851394 FILE SEGMENT: JICST-E
Study of Recycling Ash of Burnt Refuse (Part 2). Application of Slag
Result from Melting Ash of Burnt Refuse for Aggregates., 1995
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/82 (Item 32 from file: 94)
02550518 JICST ACCESSION NUMBER: 95A0578969 FILE SEGMENT: JICST-E
Study on the Chemical Components of Slag Prepared from Oota Refuse
Incineration Plant., 1995
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/85 (Item 35 from file: 94)
01520428 JICST ACCESSION NUMBER: 92A0335287 FILE SEGMENT: JICST-E
Melting Treatment of MSW Incinerator Ash and Slag Utilization., 1992
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/86 (Item 36 from file: 94)
01342483 JICST ACCESSION NUMBER: 91A0525830 FILE SEGMENT: JICST-E
Efffective utilization of melting slag from refuse incineration. (2nd
Report)., 1991JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

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2/6/87 (Item 37 from file: 94)
01342481 JICST ACCESSION NUMBER: 91A0525828 FILE SEGMENT: JICST-E
Investigation on scattering of melting slag from refuse incineration.,
1991
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)

===
2/6/88 (Item 38 from file: 94)
01249669 JICST ACCESSION NUMBER: 90A0903543 FILE SEGMENT: JICST-E
Effective utilization of the slag . Paying attention to weight reductio of

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refuse incineration residue by high temperature melting, because of
the diffeiculty in securing reclamation land., 1990
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
===
2/6/89 (Item 39 from file: 94)
01141255 JICST ACCESSION NUMBER: 90A0665583 FILE SEGMENT: JICST-E
Effective utilization of melting slag from refuse incineration., 1990
JICST-EPlus 1985-2001/Nov W3 (c)2001 Japan Science and Tech Corp(JST)
===
2/6/90 (Item 1 from file: 98)
02517550 H.W. WILSON RECORD NUMBER: BGSI93017550
Garbage in, gravel out: plasma torches transmute waste into harmless
slag .
May '93 (19930500)
General Sci Abs/Full-Text 1984-2001/Nov (c) 2001 The HW Wilson Co.
===
2/6/91 (Item 1 from file: 103)
04251714 DE-97-0GJ061; EDB-98-009078
Title: Refuse incineration slag treatment in the Hamburg-Borsigstrasse
refuse incineration plant
Original Title: Muellschlackenbehandlung in der MVB Hamburg-Borsigstrasse
Publication Date: Oct 1997
Energy SciTec 1974-2001/Sep B2 (c) 2001 Contains copyrighted material
===
2/6/92 (Item 2 from file: 103)
04028442 EDB-96-112202
Title: Integrated gasification and brick-making process for treatment
of MSW
Title: Twelfth annual international Pittsburgh coal conference:
Proceedings. Coal -- Energy and the environment
Conference title: 12. annual international Pittsburgh coal conference
Publication Date: 1995
Energy SciTec 1974-2001/Sep B2 (c) 2001 Contains copyrighted material
===
2/6/93 (Item 3 from file: 103)
03981630 NEDO-95-930346; EDB-96-065390
Title: Study of recycling ash of burnt refuse . Part 2. Application of
slag result from melting ash of burnt refuse for ceramics products
Original Title: Toshi gomi shokyakubai no sairiyo ni kansuru kenkyu. 3.
Shokyakubai yoyu slag no yogyo kenzai eno tekiyo
Publication Date: 1 Sep 1995
Energy SciTec 1974-2001/Sep B2 (c) 2001 Contains copyrighted material
===
2/6/94 (Item 4 from file: 103)
03925074 SWD-95-007617; EDB-96-008834
Title: Corrosivity of flue gas slag in refuse fueled boilers -
Background and slag synthesis
Original Title: Korrosivitet hos roekgasslagg i avfallspannor - Bakgrund
och slaggsyntes
Publication Date: Mar 1995
Energy SciTec 1974-2001/Sep B2 (c) 2001 Contains copyrighted material
===
2/6/95 (Item 5 from file: 103)
03719132 CLA-94-100748; EDB-94-135098
Title: RDF -pulverized coal co-firing in a slag combustor. Combustion tests at the
Coal Tech facility
Title: Second international conference on combustion technologies for a
clean environment
Conference title: 2. international conference on combustion technologies
for a clean environment
Publication Date: 1993
Energy SciTec 1974-2001/Sep B2 (c) 2001 Contains copyrighted material
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2/6/96 (Item 6 from file: 103)
03620671 DE-94-0G1696; EDB-94-036637
Title: Mechanical processing of refuse incinerator slag with special
emphasis on refuse incinerator scrap
Original Title: Mechanische Aufbereitung von Schlacke aus
Muellverbrennungsanlagen mit dem Schwerpunkt Schrott
Publication Date: Dec 1993
Energy SciTec 1974-2001/Sep B2 (c) 2001 Contains copyrighted material
===
2/6/97 (Item 7 from file: 103)
03423561 DE-92-013630; EDB-93-002437
Title: Possibilities of using refuse combustion slag
Original Title: Verwertungsmoeglichkeiten von Muellverbrennungsschlacke
Publication Date: Sep 1992
Energy SciTec 1974-2001/Sep B2 (c) 2001 Contains copyrighted material
===
2/6/98 (Item 8 from file: 103)
01410897 ERA-09-031119; EDB-84-108697
Title: Characterization of slag and fouling residues from co-combustion
of powdered refuse -derived fuel with residual oil and comparison with
coal and RDF residues
Title: Resource recovery from solid wastes
Conference title: Conference on resource recovery from solid wastes
Publication Date: 1982

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Energy SciTec  1974-2001/Sep B2 (c) 2001 Contains copyrighted material
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2/6/100     (Item 1 from file: 110)
00110787
Assessment of the long-term behavior of  MSW  incinerator  slag
(1997)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/102     (Item 3 from file: 110)
00081383
Baustoffgemisch zur Herstellung von Form- und Fertigteilen sowie Verfahren
zur Herstellung der Baustoffgemische. (Building material mix based on
activated waste, preferably  slag  and ash from  refuse  incineration or
power station and brick and concrete debris and waste) (In German)
(1992)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/103     (Item 4 from file: 110)
00077666
Process and device for cleaning  slag  from  refuse  incinerators(1991)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/104     (Item 5 from file: 110)
00072401
A method for incineration of  refuse  - including recycling fly ash to
convert it to  slag  and adding agent to reduce emissions of acid gases
and/or dioxin(s)
(1989)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/105     (Item 6 from file: 110)
00024367
Characterization of  slag  and fouling residues from co-combustion of
powdered  refuse -derived fuel with residual oil and comparison with coal
and  RDF  residues
(1982)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/106     (Item 7 from file: 110)
00011329
LEACHING TESTS ON  SLAG  AND ASHES FROM HOUSEHOLD  REFUSE  COMBUSTION -
RESULTS AND CONCLUSIONS IN VIEW OF WATER PROTECTION.  (IN GERMAN).
(1974)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/107     (Item 8 from file: 110)
00004456
THE OXYGEN  REFUSE  CONVERTER - A SYSTEM FOR PRODUCING FUEL GAS, OIL,
MOLTEN METAL AND  SLAG  FROM  REFUSE .
(NA)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/108     (Item 9 from file: 110)
00003856
USING  SLAG  FROM  REFUSE  INCINERATORS AS A BUILDING MATERIAL.
(NA)
WasteInfo  1974-2001/Jun (c)  2001 AEA Techn Env.
==============================================
2/6/109     (Item 1 from file: 118)
0481140  ICONDA Accession Number: 1999(07):1001569 ICONDA
Bautechnische Aspekte der Waesche von Muellverbrennungsschlacken
Engineering aspects of rinsed  slag  from  garbage  incineration plants
PUBLICATION DATE: 19990000
ICONDA-Intl Construction  1976-2001/Jan (c) 2001 Fraunhofer-IRB
==============================================
2/6/110     (Item 2 from file: 118)
0479753  ICONDA Accession Number: 1999(07):1000131 ICONDA
Muellverbrennung und Muellverbrennungsrueckstaende in Wien
Refuse  incineration processes and residual  slag  in Vienna
PUBLICATION DATE: 19980000
ICONDA-Intl Construction  1976-2001/Jan (c) 2001 Fraunhofer-IRB
==============================================
2/6/111     (Item 3 from file: 118)
0408131  ICONDA Accession Number: 1996(05):1300010 ICONDA
Des machefers d'incineration d'ordures menageres pour le chantier de la
deviation de Malzeville
HRIS (household  refuse  incineration  slag ) for the Malzeville diversion
project
PUBLICATION DATE: 19950000
ICONDA-Intl Construction  1976-2001/Jan (c) 2001 Fraunhofer-IRB
==============================================
2/6/112     (Item 4 from file: 118)
0363249  ICONDA Accession Number: 1993(10):1000376 ICONDA
MVA-Schlacken verglasen. Die Forderungen an die Auslaugbarkeit werden
strenger - neue Verfahren und Einsatzgebiete
Clinkered  slag  from  refuse  incineration plants. The demands on
leachability are becoming stricter - new methods and areas of application
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PUBLICATION DATE: 19930000
ICONDA-Intl Construction  1976-2001/Jan (c) 2001 Fraunhofer-IRB
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2/6/113     (Item 5 from file: 118)
0252372  ICONDA Accession Number: 1997(07):1000753 ICONDA
Emissionspotential einer Muellverbrennungsschlacken-Monodeponie fuer
Schwermetalle
Emission potential of a  refuse  incineration  slag  monodump for heavy
metals
PUBLICATION DATE: 19950000
ICONDA-Intl Construction  1976-2001/Jan (c) 2001 Fraunhofer-IRB
=============================================
2/6/114     (Item 6 from file: 118)
0199167  ICONDA Accession Number: 1988(02):1300030 ICONDA
Scories d'ordures incinerees comme granulat pour beton
Slag  of household  refuse  incineration used in place of aggregatein
concrete
ICONDA-Intl Construction  1976-2001/Jan (c) 2001 Fraunhofer-IRB
=============================================
2/6/115     (Item 7 from file: 118)
0191256  ICONDA Accession Number: 1994(11):1000219 ICONDA
Schlacken und staeube verglasen. Aus MVA-Rueckstaenden werden isolierende
Glaswolle, Fasern, Schaumglas oder Gussglas hergestellt
Vitrification of  slag  and dust. Insulating glass wool, fibres, foamed
glass or cast glass made from the residues of  refuse  incineration plants
PUBLICATION DATE: 19930000
ICONDA-Intl Construction  1976-2001/Jan (c) 2001 Fraunhofer-IRB
=============================================
2/6/116     (Item 1 from file: 144)
12448286   PASCAL No.: 96-0105697
Des machefers d'incineration d'ordures menageres pour le chantier de la
deviation de Malzeville
(HRIS (household  refuse  incineration  slag ) for the Malzeville
diversion project)
1995
Pascal  1973-2001/Dec W4 (c) 2001 INIST/CNRS
=============================================
2/6/117     (Item 2 from file: 144)
12118447   PASCAL No.: 95-0348877
Valorisation en structure routiere du machefer d'incineration d'ordures
menageres de l'usine de Lyon-Sud
(Upgrading of Lyon-South incineration plant household  refuse   slag  in
road structures)
1995
Pascal  1973-2001/Dec W4 (c) 2001 INIST/CNRS
=============================================
2/6/118     (Item 3 from file: 144)
07516738   PASCAL No.: 87-0018306
Scories d'ordures incinerees comme granulat pour beton
( Slag  of household  refuse  incineration used in place of aggregate in
concrete) 1986
Pascal  1973-2001/Dec W4 (c) 2001 INIST/CNRS
=============================================
2/6/123     (Item 1 from file: 305)
217021
PCDD/PCDF (polychlorinated dibenzo-p-dioxins and dibenzofurans) formation
and destruction during co-firing of coal and  RDF  ( refuse -derived
fuel) in a  slag -forming combustor.
PD- Jan 1994 ; 940100|
Analytical Abstracts  1980-2001/Dec W4 (c) 2001 Royal Soc Chemistry
=============================================
2/6/124     (Item 2 from file: 305)
033555
Analysis of effluents of an urban solid refuse incinerator: study of
methods of extraction and analysis for quantitative determination of
polychlorodibenzo-p-dioxins.
PD- 1981 ; 810000|
Analytical Abstracts  1980-2001/Dec W4 (c) 2001 Royal Soc Chemistry
=============================================
2/6/125     (Item 1 from file: 583)
05871685
\genFirmennotizen: ML Entsorgungs- und Energieanla
NETHERLANDS:  LURGI /LENTJES  GARBAGE  INCINERATION
08 Jul 1993
Gale Group Globalbase(TM)  1986-2001/Dec 26 (c) 2001 The Gale Group
=============================================
2/6/126     (Item 1 from file: 636)
02257514    Supplier Number: 44325726  (USE FORMAT 7 FOR FULLTEXT)
Converting  Garbage  to Glassy  Slag
Jan, 1994
Word Count:   196
Gale Group Newsletter DB(TM)  1987-2001/Dec 27 (c) 2001 The Gale Group
=============================================
2/6/127     (Item 2 from file: 636)
01098044    Supplier Number: 40764100  (USE FORMAT 7 FOR FULLTEXT)
Lurgi  spots promise in  RDF  cofiring
April 24, 1989
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Word Count: 556
Gale Group Newsletter DB(TM) 1987-2001/Dec 27 (c) 2001 The Gale Group

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2/6/128 (Item 4 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Melting furnace with stable discharge of slag in waste treatment
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/129 (Item 5 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Study on development of application of municipal waste-incineration
slags. Development of concrete products using crystallized slag as fine
aggregatesCA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/130 (Item 6 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method and equipment for treatment of waste garbage by gasification and
melting to produce slag byproduct
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/131 (Item 7 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Content and internal distribution of heavy metals in roots of plants
grown at alkaline pH on slag from municipal solid waste incineration
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/132 (Item 8 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for careful selection of raw material in producing melting slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/133 (Item 9 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Shaft furnaces for melting of trash with continuous discharging of molten
slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/134 (Item 10 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Hydraulic activity of eco-cement made by using slag from municipal solid
waste incinerator fly ash
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/136 (Item 12 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Manufacture of porous sintered body by using molten slag of municipal
waste and sewage sludge
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/138 (Item 14 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Chemical speciation of waste compounds in inorganic residues - A basis
for geochemical long term assessment
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/141 (Item 17 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.Manufacture of
chlorine-free slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/144 (Item 20 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Process and molten slag incinerator for treating urban domestic refuse
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/145 (Item 21 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Process integrated treatment of slag from municipal refuse incineration
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/146 (Item 22 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Long-term behavior of slag from heat treatment of municipal wastes
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/147 (Item 23 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for gasification treatment of organic waste with recycle of gas
and wastewater and particular slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/148 (Item 24 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Effect of post-combustion chamber conditions in refuse combustion
equipment on the quality of crude gas and slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/150     (Item 26 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Operation of fluidized-bed incinerator for industrial wastes or municipal
refuse treatment
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/154     (Item 30 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method and device for suppressing generation of minute algae in water by
using incinerator slag
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/155     (Item 31 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for treatment of solid waste having large water content to be
molten slag with purification of flue gas
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/157     (Item 33 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Newest developments and long-term experiences in fluidized-bed combustion
technology.
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/158     (Item 34 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
System for gasification of waste garbage and melting fly ashes with
improved slag discharge
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/159     (Item 35 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Elaboration of a MSWI fly ash solidification stabilization process: use
of statistical design of experiments
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/161     (Item 37 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Municipal refuse treatment for recovering valuable materials while
detoxicating waste gases
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/162     (Item 38 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Treatment of slag from ashes from incineration of municipal refuse and
wastewater treatment sludge
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/165     (Item 41 from file: 399)DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL
SOCIETY. All rts. reserv.
Gasification and smelting system using oxygen blowing for municipal waste
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/166     (Item 42 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Plant for incineration of garbage and melting slag and its structure
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/167     (Item 43 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Environmental properties of vitrified fly ash from hazardous and
municipal waste incineration
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/172     (Item 48 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for melting municipal refuse incineration residue without
increasing viscosity of slag
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/175     (Item 51 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Melting and burning apparatus for dry distillation and thermal
decomposition of wastes and capable of recovering granulated slag with
little heavy metal contamination
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/179     (Item 55 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Hydraulic compositions obtained from incinerator ash and their hardened
products
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
============================================
2/6/180     (Item 56 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Melting treatment of incinerator residue containing salts for slag
recovery as aggregate
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CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/182     (Item 58 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
System for gasification and melting treatment of waste garbage with
improved slag
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/183     (Item 59 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Apparatus treatment of melting slag from ash melting treatment in garbage
treatment facility to reduce lead content
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/184     (Item 60 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Production of granulated slag with smooth surface
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/185     (Item 61 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Calcium silicate compositions containing incinerator ash molten slag for
forming construction materials
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/186     (Item 62 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Characterization and assessment of refuse incinerator slag from 15 refuse
incinerators with different technology
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/187     (Item 63 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for reducing heavy metals leaching from municipal refuse
incineration ash and/or slag
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/188     (Item 64 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Valorization of LD slag with treated urban wasteCA SEARCH(R)  1967-2001/UD=13601 (c)
2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/189     (Item 65 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Combustion melting furnace for waste garbage with improved slag discharge
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/190     (Item 66 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Manufacture of high-strength rock wool from molten slag of municipal
refuse incineration ash
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/191     (Item 67 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Ground strengthening material from garbage incinerator ash-based slag
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/192     (Item 68 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Metal recovery from slag generated by melting wastes
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/193     (Item 69 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Pavement test of asphalt admixture with molten slag of municipal solid
waste incineration ash
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
==============================================
2/6/194     (Item 70 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for operation of combustion melting furnace in waste treatment
apparatus with control of slag temperature
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/198     (Item 74 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for separation of molten salt and molten slag in melting
incinerator ashes
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/199     (Item 75 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Manufacture of tiles from garbage incineration ash slag
CA SEARCH(R)  1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/200     (Item 76 from file: 399)
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DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Refuse incineration slag treatment in the Hamburg-Borsigstrasse refuse
incineration plant, GermanyCA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL
SOCIETY

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2/6/201 (Item 77 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Method for preventing lowering of fluidity of molten slag in plasma
melting furnace for treatment of municipal refuse incineration ash.
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/202 (Item 78 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Separation of pollutants from waste gases from municipal incinerators
using furnace ash and/or slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/203 (Item 79 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Process for separation of copper and heavy metals from incinerated
garbage residue and slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/204 (Item 80 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Actual data report of residue and fly ash melting, and slag recovery in
the MSW incineration plant
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/206 (Item 82 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Behavior of slag derived from DIS (special industrial wastes) and used
for road building. Comparison with slag from incineration of domestic waste
(OM)
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/207 (Item 83 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Modification of steelmaking slag by utilization of noncombustibles in
city garbage
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/208 (Item 84 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Serial batch tests performed on municipal solid waste incineration bottom
ash and electric arc furnace slag, in combination with computer modeling
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/209 (Item 85 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Melting of incinerator ash and fly ash in slag discharge type rotary kiln
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/210 (Item 86 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Coloring of molten slag from garbage incineration
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/211 (Item 87 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Heat-treating process for combustible material-containing waste solids
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/212 (Item 88 from file: 399)DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL
SOCIETY. All rts. reserv.
Molten slag from municipal refuse for pavement
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/213 (Item 89 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Processing slag from incineration of municipal wastes
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/214 (Item 90 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Processing of municipal and other wastes in molten slag bath
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/215 (Item 91 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Treatment process for residues in refuse incinerator plants
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/216 (Item 92 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Incinerator flue gas cleaning with milled slag sorbents
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/217 (Item 93 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
The influence of combustion bed temperature during waste incineration on slag quality
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/218 (Item 94 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Fusion of slags by the HSR process
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/219 (Item 95 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Logistics and management of mechanical slag beneficiation
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/220 (Item 96 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Slag processing and utilization by an association for disposal and use of waste (GfA) in the Geiselbullach waste incinerator power plant (Germany)
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/222 (Item 98 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Mechanical slag beneficiation technologies and mechanical equipment of the system KHD Humboldt Wedag AG
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/223 (Item 99 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Slag beneficiation through aging and leaching
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/224 (Item 100 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
DBA-roller grate-direct current firing for optimization of slag qualityCA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/225 (Item 101 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Criteria and acceptance questions for slag utilization in Switzerland
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/226 (Item 102 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Quantity, quality, and utilization possibilities of waste incinerator slags - general review
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/227 (Item 103 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
VS Combi reactor of Kuepat AG firm for melting of wastes and combustion residues
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/228 (Item 104 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
A study on the behavior of PCDDs/DFs in a municipal refuse fly-ash melting experiment
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/229 (Item 105 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Vitrification of slags and dusts (from refuse incinerators)
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/230 (Item 106 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Statistical analyses of control parameters for physicochemical properties of solidified incinerator fly ash of municipal solid wastes
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/232 (Item 108 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Study on transformation of Cr6+ in codisposal of chromium slag and domestic garbage
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/233 (Item 109 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Manufacture of melting slag from incinerator ashes from municipal refuse
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/234 (Item 110 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Manufacture of high grade materials from molten slag and low temperature

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sintered articles therefrom
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/237 (Item 113 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Melting process of ash from municipal incinerators by plasma arc heating
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/238 (Item 114 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Development of an MSW ash melting system of low running cost
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/239 (Item 115 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Ecologically clean technology for processing of municipal wastes in a
Vanyukov furnace
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/240 (Item 116 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
The presence and distribution of heavy metals in municipal solid waste
incinerators
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/241 (Item 117 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Melting furnaces for waste solid treatment
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/242 (Item 118 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Recovery of vanadium pentoxide by chlorination in hydrochloric acid
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/243 (Item 119 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Utilization of refuse incineration slags after conventional processing.
Part 1
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/244 (Item 120 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
The use of waste materials in civil engineering. AVI slag can replace
gravel in concrete production
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/245 (Item 121 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Wastes, combustion, and then? Qualitative and quantitative aspects of
residues from combustion plants
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/246 (Item 122 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Effect of additions of refuse-incineration-plant (MSZ) slag and a
plasticizer on cement structure
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/247 (Item 123 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Development of municipal solid waste (MSW) ash melting system of IHI
rotary stoker type incinerator
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/248 (Item 124 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.A method for
incineration of refuse
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/249 (Item 125 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Multielement analysis of city waste incineration ash and slag by
inductively coupled plasma atomic emission spectrometry
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/250 (Item 126 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Slag from refuse-incinerating plants for cement concretes
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/251 (Item 127 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Solidification materials for solid wastes and soils
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/252 (Item 128 from file: 399)

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DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Short term release of slag and fly ash produced by incineration of
municipal solid waste
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/253 (Item 129 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Use of ash and slag from the processing of solid refuse
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/254 (Item 130 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Mortar containing municipal refuse incineration ash fused slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/255 (Item 131 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Concrete plates from municipal refuse incineration ash fused slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/256 (Item 132 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Process for removal of flue dust and/or slags from municiple refuse
incinerators
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/257 (Item 133 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Discharge control of fused slag of municipal incinerator ash
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/258 (Item 134 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Optimization of waste combustion plants with the goal of decreasing air
pollution
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/259 (Item 135 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Process for waste decomposition
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/260 (Item 136 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Emissions arising during the combustion of high calorific industrial
wastes in a municipal incineratorCA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN
CHEMICAL SOCIETY

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2/6/261 (Item 137 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Leaching behavior of residues from waste incineration plants. 2.
Exemplified by the Grossmehring refuse landfill
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/262 (Item 138 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Leaching behavior of residues from waste incinerators, as illustrated by
the Grossmehring landfill. (Part 1)
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/263 (Item 139 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Treatment of liquid wastes
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/264 (Item 140 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Structure of ceramics produced with slag from city solid refuse
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/265 (Item 141 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Fusion and leaching of dust from waste incinerators
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/266 (Item 142 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Fertilizers from city garbage
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/267 (Item 143 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Melting of ashes
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY

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2/6/268 (Item 144 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.

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Treatment of municipal waste leachate by granulated slag
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/269 (Item 145 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Molten iron bath incinerator for solid wastes
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/271 (Item 147 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Leaching of incinerator slag from municipal waste
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/273 (Item 149 from file: 399)DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Refractory tamping, spraying, and casting masses for coating slag-tap and cyclone furnaces of power plants and refuse incinerators
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/275 (Item 151 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Leaching experiments on the slag from refuse incineration
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/276 (Item 152 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Refuse slag fusion - experiences and expectations
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/277 (Item 153 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Leaching tests on slag and ashes from household refuse combustion - results and conclusions in view of water protection
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/278 (Item 154 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Leaching tests on slag from refuse combustion - results of Swiss studies
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/280 (Item 156 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Effect of increasing doses of refuse slag on the yield and on the content of trace elements in wheat
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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2/6/281 (Item 157 from file: 399)
DIALOG(R)File 399:(c) 2001 AMERICAN CHEMICAL SOCIETY. All rts. reserv.
Preparation of raw slag of refuse incineration plants
CA SEARCH(R) 1967-2001/UD=13601 (c) 2001 AMERICAN CHEMICAL SOCIETY
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Office of Fossil Energy, U.S. Department of Energy DOE/FE-0215P-39 Issue No. 39, Spring 2000

CLEAN COAL TODAY

A Newsletter about Innovative Technologies for Coal Utilization

Project News Bytes

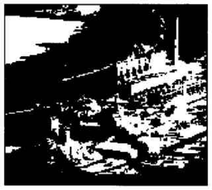
In December 1999, George Rudins, DOE Office of Fossil Energy Deputy Assistant Secretary for Coal and Power Systems, was named 1999 winner of the **Washington Coal Club's Achievement Award**. The membership of the Washington Coal Club comprises private sector and government representatives working on coal issues and, for the past 20 years, has annually recognized members of Congress, industry, labor leaders, and government officials. Rudins was cited for his leadership in advancing clean coal technologies, as well as promotion of innovative concepts for pollution control, climate change mitigation, and carbon sequestration. He is also the author of FE's Vision 21 plan for a futuristic, virtually non-polluting fossil fuel energy plant.

See "News Bytes" on page 3...

In This Issue

Wabash Completes Fourth Year of Commercial Operation

One of the world's pioneering commercial-scale coal gasification-based power facilities, Wabash River's Integrated Gasification Combined-Cycle (IGCC) plant, has successfully completed its fourth year of commercial operation and processed over one-and-a-half million tons of coal. A winner of *Power* magazine's 1996 Powerplant Award, as well as other honors, Wabash River is one of the cleanest coal-fired facilities in the world, and has contributed greatly to the commercial potential of this advanced coal-based power generation technology. Gasification is already in wide use for syngas-to-chemical production, and under the DOE Office of Fossil Energy Vision 21 initiative, coal-based IGCC is expected to coproduce power and high-value chemicals and clean transportation fuels.



The 262-MWe Wabash River IGCC project repowered an existing facility.

DOE selected Wabash River in September 1991 as a Clean Coal Technology (CCT) Program Round IV demonstration project, and the Cooperative Agreement between the industrial participants and DOE was signed in July 1992. Commercial operation began in December 1995. The Cooperative Agreement ended in January 2000 after a four-year commercial demonstration, and the plant continues in commercial operation.

The original Participant was the Wabash River Coal Gasification Repowering Project Joint Venture, formed in 1990 by Destec Energy, Inc. of Houston, Texas and PSI Energy, Inc. of Plainfield, Indiana. Destec owned and operated the gasification facility, and PSI Energy owned and operated the power generation facility. In 1997, Houston-based Dynegy, Inc. purchased Destec. A final transfer took place last December when Global Energy, Inc. purchased Dynegy's gasification assets and technology. PSI Energy remains the owner and operator of the generating facility.

Major Repayment Made to DOE

Global Energy plans to market and license the Destec Gasification Process under the name: "E-GAS Technology™." Dynegy has repaid DOE $550,000 — $300,000 for the facility and $250,000 for the technology. Global Energy

See "Wabash" on page 2...

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...Wabash continued

will promote commercialization of the technology, and make repayments on future equipment sales or licenses for a 20-year period.

THE PROJECT

The project is located at PSI's Wabash River Generating Station near West Terre Haute, Indiana. PSI repowered a 1950s vintage steam turbine and installed a new syngas-fired combustion turbine while continuing to utilize locally mined high-sulfur Indiana bituminous coal. The repowered steam turbine produces 104 MWe that combines with the combustion turbine generator's 192 MWe and the system's auxiliary load of 34 MWe to yield 262 MWe (net) to the PSI grid.

GASIFICATION PROCESS

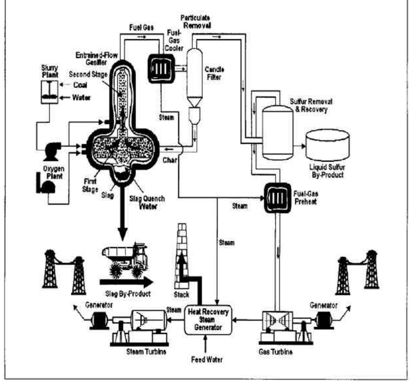
The Wabash Project features the integration of the E-GAS process with an advanced General Electric MS 7001 FA high-temperature gas turbine. The E-GAS process features an oxygen-blown, two-stage entrained flow gasifier capable of operating on both coal and petroleum coke, with continuous slag removal.

As illustrated in the schematic, syngas is generated from gasification of a coal/water slurry with 95 percent oxygen in a reducing atmosphere at 2,600 °F and pressure of 400 psig. The syngas produced from coal comprises 45.3 percent carbon monoxide, 34.4 percent hydrogen, 15.8 percent carbon dioxide, 1.9 percent methane, and 1.9 percent nitrogen, and has a higher heating value of 277 Btu per standard cubic foot (dry basis). The ash melts and flows out of the bottom of the vessel as a vitrified slag (frit) by-product. Additional coal/water slurry added to the second gasification stage undergoes devolatilization, pyrolysis, and partial gasification to cool the raw gas and increase its heating value. The syngas flows to a heat recovery unit, producing high-pressure saturated steam that is superheated and used to drive a steam turbine. Subsequently, the particulates (char) in the raw gas are removed with a hot/dry candle filter and recycled to the gasifier where the remaining carbon is converted to syngas. After particulate removal, the syngas is water-scrubbed for chloride removal and passed through a catalyst that hydrolyzes carbonyl sulfide to hydrogen sulfide. The hydrogen sulfide is removed using methyldiethanolamine absorber/stripper columns. The syngas is then burned in a gas turbine that produces electricity. Gas turbine exhaust heat is recovered in a heat recovery steam generator to produce steam that drives the steam turbine to produce more electricity.

Over its four years of operation, the plant has demonstrated an impressive record of continually increasing reliability and syngas production, with 2.7×10^{12} Btu in 1996, 6.2×10^{12} Btu in 1997, and 8.8×10^{12} Btu in 1998. Overall, plant availability has increased from 56 percent in 1997 to 72 percent in 1998 and 79 percent in 1999. Thermal efficiency (HHV) is 39.7 percent on coal and 40.2 percent on petroleum coke compared to the 33–35 percent figure for conventional pulverized coal-fired plants. The greater the thermal efficiency, the less coal is needed to generate a given amount of electricity, thereby reducing both fuel costs and carbon dioxide emissions.

Emissions from Wabash River's IGCC facility are 0.1 pounds of SO_2 and 0.15 pounds of NO_x per million Btu of coal input. This SO_2 emission rate is less than one-tenth the emission limit set for the year 2000 by the acid rain provisions of the Clean Air Act Amendments of 1990. Particu-

E-GAS PROCESS



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late emissions are less than the detectable limit set by EPA-approved emission measuring methods.

Another major environmental advantage at Wabash is the production of useful by-products. From startup through the end of 1999, Wabash has recovered and sold 33,888 tons of elemental sulfur (99.99 percent purity) for agricultural applications.

The IGCC technology demonstrated at Wabash River is an ideal candidate for repowering the more than 95,000 megawatts of existing U.S. coal-fired utility boilers that are more than 30 years of age, and for meeting the needs of a burgeoning foreign power generation market.

For more details on this and other CCT Program Demonstration Projects, please visit the Clean Coal Technology Compendium web site at http://www.lanl.gov/projects/cctc/.

Award-winning Wabash River IGCC plant continues in commercial operation after four years of successful demonstration.

...News Bytes continued

ENCOAL assets and responsibilities assumed by SGI International. SGI International (SGI) has purchased all ENCOAL plant assets from AEI Resources, which includes assuming full responsibility for marketing and repayment obligations to DOE. SGI has been actively securing customers for the plant's products in order to support the re-start of the mothballed demonstration plant. The company is adding new partners to share plant operating costs, and anticipates re-start by mid-2000. In a related action, SGI International has signed a long-term agreement with American Electric Power (AEP) to transport upgraded coal from the ENCOAL Demonstration Plant near Gillette, Wyoming to AEP's Cook Coal Terminal at Metropolis, Illinois for further barge delivery to various SGI customers, including AEP. This agreement provides a valuable incentive for SGI to restart the plant as well as move ahead with a larger commercial plant.

Fuel cell subcontract approved for Kentucky Pioneer IGCC Project. DOE has reviewed and approved the subcontract between Fuel Cell Energy (FCE) and Kentucky Pioneer L.L.C. FCE is planning to build and operate a 2-MWe molten carbonate fuel cell (MCFC) on a slipstream of clean syngas from the 400-MWe plant. FCE will scale up the design of their module from an existing 250-kW test facility. The FCE activity will cost about $34 million, of which DOE will fund 50 percent. The IGCC project is planned for an existing power plant site in eastern Kentucky and is currently in the design and permitting stage. When completed, this will be the largest commercial-scale IGCC and MCFC facility to operate on coal-derived syngas.

Rosebud SynCoal reorganizes to better align interests. Western SynCoal Co., Montana Power's research and development arm for enhanced coal technologies and products, has reorganized to reduce administrative costs and better align its interests with those of Western Energy Co., an affiliated coal mining company. Under the new structure, Western SynCoal and two other entities, SynCoal Inc. and the Rosebud SynCoal Partnership, will form Western SynCoal LLC, a limited liability company. Western SynCoal was the operating entity of the partnership formed in 1992 between subsidiaries of The Montana Power Company and Northern States Power Company (NSP) to enhance low-quality coals by improving their heating values while removing moisture, sulfur, and ash through an Advanced Coal Conversion Process (ACCP). Over the years, Western SynCoal bought out NSP's interest.

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INTEGRATED GASIFICATION FUEL CELL (IGFC) DEMONSTRATION TEST

George Steinfeld, Hossein Ghezel-Ayagh, Robert Sanderson, Sandors Abens

FuelCell Energy, Inc.
3 Great Pasture Road
Danbury, CT 06813-1305

Introduction

Power generation in the United States relies heavily on coal with 56.3% of the power or 1807 billion kilowatt-hours generated using coal in 1998 as shown in Figure 1. As total U.S. coal consumption increases from 1043 to 1279 million tons a year between 1998 and 2020, the average annual increase is projected to be 0.9 percent. About 90 percent of the coal consumed in the U.S. is used for power generation. In the next 20 years, coal is expected to remain the primary fuel for power generation, although its share of total generation declines between 1998 and 2020 as natural gas increases its share[2].

As concern about the environment generates interest in ultra-clean energy plants, fuel cell power plants can respond to the challenge. Fuel cells convert hydrocarbon fuels to electricity at efficiencies exceeding conventional heat engine technologies while generating extremely low emissions. Emissions of SOx and NOx are expected to be well below current and anticipated future standards. Nitrogen oxides, a product of combustion, will be extremely low in this power plant because power is produced electrochemically rather than by combustion. Due to its higher efficiencies, a fuel cell power plant also produces less carbon dioxide. Fuel cells in combination with coal gasification, are an efficient and environmentally acceptable means to utilize the abundant coal reserves both in the United States and around the world.

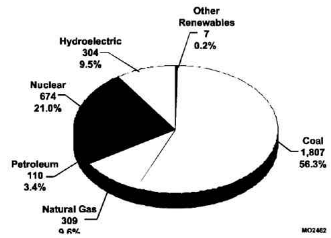

Figure 1

1998 U.S. Electric Generation by Fuel Type (Billion Kilowatt-hours)[1]

Source: U.S. DOE/EIA "Annual Energy Review 1998" (Data for U.S. Electric Utilities)

To demonstrate this technology, FuelCell Energy Inc. (FCE), is planning to build and test a 2-MW Fuel Cell Power Plant for operation on coal derived gas. This power plant is based on Direct Fuel Cell (DFC™) technology and will be part of a Clean Coal V IGCC project supported by the US DOE. A British Gas Lurgi (BGL) slagging fixed-bed gasification system with cold gas

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clean up is planned as part of a 400 MW IGCC power plant to provide a fuel gas slip stream to the fuel cell. The IGCC power plant will be built by Kentucky Pioneer Energy, a subsidiary of Global Energy, in Clark County, KY.

This demonstration will result in the world's largest fuel cell power plant operating on coal derived gas. The objective of this test is to demonstrate fuel cell operation on coal derived gas at a commercial scale and to verify the efficiency and environmental benefits.

Fuel Cell Power

The carbonate fuel cell derives its name from its electrolyte, which is made up of potassium and lithium carbonates. Figure 2 shows a simplified flow schematic of the carbonate fuel cell power plant. Syn-gas from the gasification plant clean-up system is cleaned up further and moisturized. The moisturized syn-gas is fed to the anode side of the fuel cell where methane is internally reformed and CO is shifted to CO_2 and H_2. Spent fuel exits the anode and is further oxidized in the anode exhaust oxidizer to supply oxygen and CO_2 to the cathode. The resulting reactions in the fuel cell anode and cathode produce DC output which is inverted to AC. The cathode exhaust supplies heat to the fuel clean-up, steam boiler and co-gen system as it is vented from the plant.

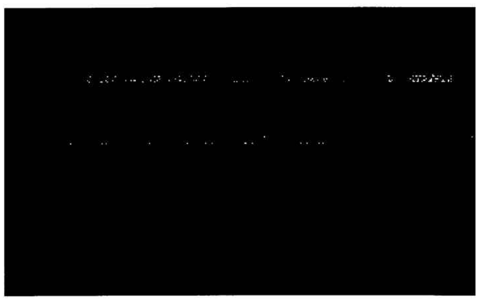

Figure 2.
Fuel Cell Power Plant Simplified Process Schematic

A 3-MW fuel cell power plant designed to operate on natural gas, shown conceptually in Figure 3, will be the basis for the power plant operating on coal derived gas. Two fuel cell modules, each housing four fuel cell stacks, produce the DC power. An inverter converts the DC power to AC. The balance of plant equipment includes thermal management, water treatment, switchgear and controls.

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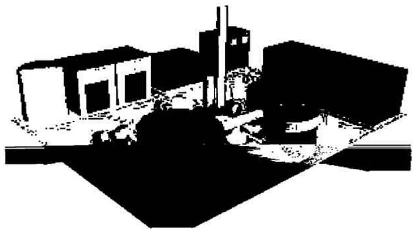

Figure 3
3-MW Fuel Cell Power Plant for Natural Gas

System studies

Fuel cell systems operating on coal have been studied extensively in past years. A simplified block diagram of a fuel cell power plant system is shown in Figure 4. Gasification is used to convert the solid fuel to a gas which is processed to remove sulfur compounds, tars, particulates, and trace contaminants. The cleaned fuel gas is converted to electricity in the fuel cell. Waste heat from the carbonate fuel cell is used to generate steam required for the gasification process and to generate additional power in a bottoming cycle.

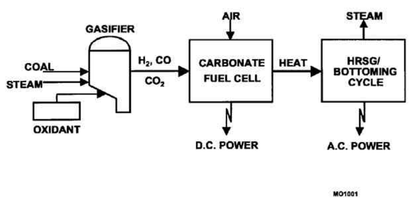

Figure 4
Integrated Gasification Fuel Cell System Simplified Block Diagram

At a 200 MW scale, past studies[4,5,6] indicated that using conventional gasification and clean-up technologies, a heat rate of 7379 (46.3 % HHV efficiency) can be achieved with IGFC utilizing BGL gasification and low temperature clean-up. This plant would require 1800 tons/day coal

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and generate a net output of 205 MW. Later studies[7,8,11] indicated that higher efficiencies, 51.7% –53.5%, can be achieved with higher methane producing gasifiers and by using hot gas clean-up. More recently[12], studies of hybrid fuel cell/turbine systems have shown that LHV efficiencies of 70% can be achieved on natural gas. This system utilizes a gas turbine as a bottoming cycle to the fuel cell, as shown in Figure 5. This concept can be applied to coal gas systems as well.

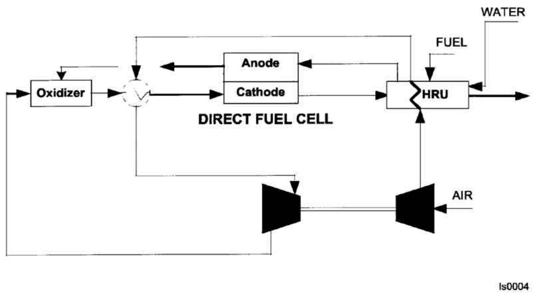

Figure 5
High Efficiency Hybrid Fuel Cell/Turbine Power Cycle

Emissions from this plant would be extremely low and below any current or anticipated future standards. Figure 6 compares the combined SOx, NOx, and solid waste emissions of existing commercial technologies, IGCC and IGFC. IGFC technology achieves the lowest levels of pollutant emissions in addition to lower CO_2 emissions and make-up water requirements. The CO_2 emission is 1.54 lb/kWh and the make-up water requirement is 6.8 GPM/MWh.

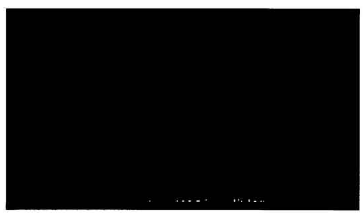

Figure 6
Environmental Impact Comparison of IGFC and Other Technologies

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Experimental testing

Experimental testing of a 20 kW sub-scale fuel cell stack was conducted[9] at Louisiana Gasification Technology Inc. (LGTI) in 1993-4 by Destec as shown in Figure 7. This was the world's first test of a carbonate fuel cell on coal derived gas. Gas from the entrained flow Destec gasifier was further cleaned-up after bulk gas clean-up by the fuel cell test facility and supplied to the fuel cell. The fuel cell operated on syn gas from the gasifier and interchangeably with natural gas providing normal performance and stable operation.

Figure 7
20 kW Carbonate Fuel Cell Test at the LGTI Gasification Facility

After completion of the test, the fuel cell was disassembled for post-test inspection. Analysis of the components indicated no evidence of degradation and no detectable accumulation of coal gas borne contaminants in the fuel cell electrolyte or in the hardware. These results paved the way for a larger scale demonstration test.

Clean coal demonstration test

FuelCell Energy is planning to build and test a 2-MW carbonate fuel cell power plant as part of the Kentucky Pioneer Energy Project by Global Energy. The plant will be located in Trapp, KY and will be operational in 2003. This project, supported by DOE as part of the Clean Coal Technology Program will include a 400-MW Integrated Gasification Combined Cycle (IGCC) and a 2-MW fuel cell power plant (Integrated Gasification Fuel Cell, IGCF) as shown in Figure 8. The project will feature Advanced Fuel Technology briquettes made of Kentucky coal and Municipal Solid Waste (MSW) as fuel in the gasification process, adding a renewable fuel component to the project. The use of municipal solid waste as fuel reduces fuel cost to the power plant and provides low cost waste elimination. British Gas/Lurgi (BGL) gasification technology and General Electric advanced turbine power generation will be utilized for the IGCC.

As shown in Table 1 emissions from this plant will be significantly lower than conventional coal fired plants using PC boiler, atmospheric fluidized bed, and pressurized fluidized bed technologies.

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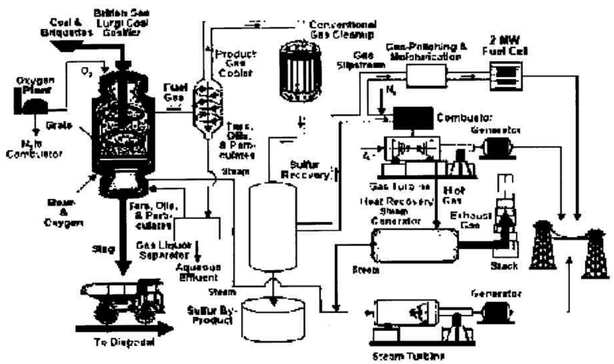

Figure 8
400-MW IGCC and 2-MW Fuel Cell Power Plant Process Flow Diagram[14]
Source: DOE Project Fact Sheet (Modified)

Table 1
Typical Emission Levels and Waste from Coal Based Power Plant Types

2.5% SULFUR EASTERN COAL *Source: EPRI With Adjustments By Duke Energy*				
PLANT TYPE	SO_2 EMISSIONS LB/MWH	NO_x EMISSIONS LB/MWH	SOLID WASTE (DRY) LB/MWH	CO_2 VENT GAS LB/MWH
Pulverized Coal (PC w/ESP Only)	35.7	11.2	136	1871
Pulverized Coal with FGD and LNB (90 percent S Removal, NO_x Control	3.6	5.8	232	1908
Atmospheric Fluidized Bed Combustion (AFBC)	3.6	4.9, 0.5 (SNCR)	249	1975
Pressurized Fluidized Bed Combustion (PFBC)	3.3	0.9	230	1826
Integrated Gasification combined cycle (IGCC) (99 Percent S Removal)	0.3	0.9	123	1695
BGL IGCC (99 Percent S Removal, 15 PPM NO_x)	**0.3**	**0.4**	**115**	**1585**
BGL IGFC	**0.25**	**0.18**	**90**	**1540**

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Appendix D

COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION
In the Matter of:
APPLICATION OF EAST KENTUCKY POWER COOPERATIVE, INC. FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY, AND A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY, FOR THE CONSTRUCTION OF A 250 MW COAL-FIRED GENERATING UNIT (WITH A CIRCULATING FLUID BED BOILER) AT THE HUGH L. SPURLOCK POWER STATION AND RELATED TRANSMISSION FACILITIES, LOCATED IN MASON COUNTY, KENTUCKY, TO BE CONSTRUCTED ONLY IN THE EVENT THAT THE KENTUCKY PIONEER ENERGY POWER PURCHASE AGREEMENT IS TERMINATED
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CASE NO.
2001-053
O R D E R

East Kentucky Power Cooperative, Inc. ("East Kentucky") filed its application on March 9, 2001 for a Certificate of Public Convenience and Necessity and a Certificate of Environmental Compatibility to construct a 250 MW coal-fired generating unit, referred to as "Gilbert," at the Hugh L. Spurlock power station ("Spurlock") and related transmission facilities in Mason County, Kentucky. The Gilbert unit was to be constructed only in the event that East Kentucky's prior agreement to purchase the output of a 540 MW generating unit proposed by the Kentucky Pioneer Energy, L.L.C. ("KPE") is terminated. The Attorney General's Office ("AG") and the Kentucky Natural Resources and Environmental Protection Cabinet, Department of Natural Resources, Division of Energy ("DOE") were granted intervention and a hearing was held on August 18, 2001..

On July 11, 2001, East Kentucky amended its application to eliminate the contingent nature of its request because KPE had not met its financial closing deadline of June 30, 2001. The amended application also revised Gilbert's output from 250 MW to 268 MW. East Kentucky has not terminated the power purchase agreement because the power will be sold at a very reasonable price and KPE has indicated that it believes it can obtain project financing by March 2002. However, due to the delay in KPE's financing, East Kentucky decided that it cannot reasonably rely on that project to satisfy its future power supply needs. Therefore, East Kentucky has concluded that it should proceed to build the Gilbert unit. In the event that KPE is able to secure project financing, East Kentucky stated that certain provisions in the existing purchase power agreement would have to be revised and any renegotiated contract will be resubmitted to the Commission for its prior approval.

East Kentucky submitted to the Natural Resources and Environmental Protection

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Cabinet ("Natural Resources Cabinet") a statement of environmental compatibility for the proposed Gilbert unit. By letter dated May 23, 2001, the Natural Resources Cabinet

reported that East Kentucky's proposed Gilbert plant will be environmentally compatible. East Kentucky determined that additional power will be needed to meet its future load requirements and it issued a request for proposal to utilities and power marketers on January 11, 2001. Several responses were received, but East Kentucky's analysis shows that the proposed Gilbert unit will have the lowest cost. Additional analyses were performed in response to the request of the AG. One of those analyses shows that adding one 93 MW combined cycle unit in April 2004 and waiting for the KPE project to develop will cost $114 million less than adding the Gilbert unit now and then relying on the KPE development. East Kentucky rejected this scenario, claiming that it should not place all of its new base load requirements at market risk, contingent on the development of the KPE project as a commercially viable plant.

The AG recommends that East Kentucky's request to construct the Gilbert unit be granted. However, if KPE achieves financial closure by the summer of 2002, the AG suggests that the Commission and the parties explore cancellation of the Gilbert unit. DOE recommends that East Kentucky should complete a full and comprehensive study of the technical potential of demand-side resources and distributed generation in its service territory before proceeding to construct any new generation.

Based on East Kentucky's supply analyses, the uncertainty of the KPE project, and East Kentucky's need for additional power, the Commission finds that the construction of the Gilbert unit should be approved. Further, the Commission finds that when the KPE project achieves financial closure, East Kentucky should refile the power purchase agreement for review and approval by the Commission. The filing should include an analysis of the feasibility of the cancellation of the Gilbert unit and the substitution of a 93 MW combined cycle unit. In addition, the Commission finds that East Kentucky should continue to review the feasibility of demand side resources and provide a detailed analysis of its review in future filings related to generating capacity.

The Gilbert unit has the ability to burn not only coal but also wood waste and other biomass products due to the nature of a circulating fluid bed boiler. East Kentucky did not propose to include as part of the initial construction the handling facilities necessary to burn any of these other products. The AG recommended that the wood waste handling facilities be included in the unit design and that wood waste be.-4- considered as one of the primary fuels. East Kentucky acknowledged that the wood waste handling facilities would cost $2.5 to $3 million and have a relatively short payback. Due to the potential cost savings over time from burning biomass, the Commission finds that East Kentucky should conduct a detailed analysis of fueling the Gilbert unit with wood waste and other biomass products.

East Kentucky indicated that additional transmission facilities would be needed to maintain stability of the unit at the Spurlock station. A transmission line will be needed to connect to transmission facilities owned by Cinergy Corp. East Kentucky indicated that certain agreements are necessary between the utilities, and additional time will be needed to finalize those agreements. Because of the potential delay in finalizing the transmission agreements, East Kentucky proposed to delete the transmission portion of its application and proceed only with the proposed generating facilities. The Commission finds East Kentucky's proposal to be reasonable.

IT IS THEREFORE ORDERED that:

1. East Kentucky is granted a Certificate of Public Convenience and Necessity and a Certificate of Environmental Compatibility to construct the Gilbert unit, a 268 MW coal-fired generating unit with a circulating fluid bed boiler, at the Spurlock station at an estimated cost of $367 million.
2. East Kentucky shall conduct a detailed analysis of the benefits of fueling with wood waste and other biomass products and file that analysis upon completion.
3. East Kentucky's request to delete from consideration at this time the construction of needed transmission facilities is granted. Within 30 days of completing all analyses, including the selection of a final route for the transmission facilities and the.execution of all necessary agreements with other utilities, East Kentucky shall file a new

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application for approval of the proposed transmission facilities.
Done at Frankfort, Kentucky, this 26 th day of September, 2001.
By the Commission

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Appendix E

APPLICATION OF BGL GASIFICATION
OF SOLID HYDROCARBONS FOR
IGCC POWER GENERATION
2000 Gasification Technologies Conference
San Francisco, California
October 8-11, 2000
Presented by:
GLOBAL ENERGY INC.
Richard A. Olliver
With support from:
GENERAL ELECTRIC POWER SYSTEMS
John M. Wainwright
PRAXAIR
Raymond F. Drnevich.2
ABSTRACT
Since last year's GTC Conference, a considerable number of significant events have occurred in the gasification technology marketplace. New IGCC projects have come on stream with commercial operation, other new IGCC projects have been announced and started in development, environmental issues have gained emphasis, and energy prices, notably natural gas, have escalated dramatically. Directionally, all of these events appear to have created a more favorable atmosphere for IGCC projects.
Related to an ongoing IGCC project currently in development, a joint analysis has been performed by Global Energy, General Electric Power Systems, and Praxair to evaluate technical and economic elements for the performance of BGL Gasification Technology based on solid hydrocarbon fuel feed to an IGCC for power generation.
Results of the analysis provide a picture of the relative economics in today's environment for electrical power generation by conventional natural gas fired combined cycle power systems compared to using BGL Gasification Technology in an IGCC configuration..3
INTRODUCTION
Over the last few years there have been a number of new Integrated Gasification Combined Cycle (IGCC) plants placed in operation, under construction, or otherwise in development, representing numerous technologies and fuel applications. Typically, the new IGCC plants have utilized either solid or liquid hydrocarbons as feed, gasification methods including entrained flow, fixed bed or fluid bed technologies, and power blocks utilizing various gas turbine systems

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and manufacturers.

Global Energy has several commercial IGCC projects under development based on using BGL Gasification Technology to gasify solid hydrocarbons for power production. Coincident with these development efforts, several feasibility studies have been performed related to diverse applications of the BGL Gasification Technology. This paper deals with the application of BGL Gasification Technology fueled with coal and incorporating an Oxygen plant provided by Praxair and a Power Island using 7FA Gas Turbines provided by General Electric Power Systems.

MACRO-ECONOMIC BACKGROUND

The original concept for performing this particular analysis evolved from ongoing technical analyses and business discussions related to several IGCC projects currently in development by Global Energy. The origins of these projects considered site issues and microeconomics of project specifics; additionally Global Energy kept an eye on the fundamental macroeconomic issues that were driving the IGCC industry and furthering its growth.

The interesting event that occurred at the inception of this analysis was the dramatic increase in energy prices this year, notably in prices for electrical power and natural gas. Accordingly, the analysis shifted its focus to consider the position of BGL Gasification Technology in the IGCC industry, the economic status of a commercial BGL based IGCC relative to power from natural gas, and a consideration of other factors of note in the rapidly changing world of energy prices.

BASIS FOR ANALYSIS

For purposes of this analysis, a single design case was developed and analyzed for the BGL Gasification Technology application, essentially considering use of Pittsburgh # 8 coal as the solid hydrocarbon feed to the Gasification Island..4

OVERALL IGCC CONFIGURATION

As shown in Attachment C, the overall project configuration includes the Gasification Island, comprised of the BGL gasification units, ASU, and syngas cooling and cleanup units, and the Power Island, which consists of two General Electric 7FA gas turbine generators and HRSGs and one steam turbine, all optimized for firing on syngas, but capable of operation on natural gas. At site design, ambient conditions of 59°F, 14.28 psia and 60% RH, Gross and Net Electrical Power Output are approximately 586MW and 538MW, respectively, and Net Heat Rate is 8072 BTU/KWh, HHV. Plant capital cost is assumed to be $1000/KW. The plant includes normal offsites, utilities and infrastructure required to support the main operating units.

GASIFICATION ISLAND

As shown in Attachment D, the BGL Gasification process is a fixed bed type gasifier that uses a lock hopper system to admit dry feed to the pressurized reaction vessel. The gasifier units are refractory lined and water jacket cooled. As the feedstock descends it is heated by rising high temperature gases. Moisture and volatile light hydrocarbons leave the coal soon after the feed

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enters the gasifier unit and exit the gasifier with the syngas stream. Oxygen and steam are injected near the bottom of the unit and react with devolatilized coal to provide thermal energy needed for the formation of syngas components. The high temperature also converts the inert ash content of the coal into vitreous frit or slag.

The vitreous frit is removed from the bottom of the gasifier via a lock hopper and is water quenched, thus capturing the inorganic content of the feedstock as a glassy silica matrix material resembling coarse sand. The vitreous frit is an environmentally benign synthetic aggregate material suitable for use as roadway base, roofing material and seawall construction.
The BGL Gasification IGCC system offers the following features:
- High gasification efficiency (carbon conversion), typically over 92%,
- Use of run-of-the-mine coal or other carbon-based feedstock,
- High thermal efficiency and simple heat exchanger for convenient heat recovery,
- High gasifier throughputs,
- Superior environmental performance, and
- A closed loop system with no primary stack and no ash residue.

The synthesis gas produced in this process is made up primarily of carbon monoxide and hydrogen (more than 85% by volume), and smaller quantities of carbon dioxide and methane..5
Hot syngas leaving the top of the gasifier is quenched and purified. Particulates and other impurities are removed in this initial gas processing stage. Heavier oils and tars will condense during cooling, and are returned to the gasifiers for reflux into the hearth zone.
Sulfur compounds in the feedstock are converted mainly to H2S and smaller quantities of COS in the raw syngas. Over 99% of these are removed through acid gas cleanup and sulfur recovery units prior to combustion in the gas turbines, resulting in exceptionally low SO2 emissions. The acid gas cleanup is accomplished using a selective solvent; the sulfur recovery is accomplished with the use of a process unit employing the Claus reaction to generate elemental sulfur. The elemental sulfur in these compounds is a commercially saleable product.
POWER ISLAND
The Power Island is based on a configuration of two trains of dual-fuel General Electric 7FA gas turbines with hydrogen-cooled generators. Each train is coupled to its own Heat Recovery Steam Generator (HRSG), which together will provide superheated steam for a single steam turbine generator. The system enables transfer to natural gas should syngas flow be interrupted. This provides for Power Island availability equal to that of conventional natural gas fired power plants.
Prior to entering the gas turbine combustor, the syngas is saturated with water and is then superheated. Additionally, nitrogen from the ASU is moisturized, superheated, and injected into

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