FINAL TECHNICAL REPORT
September 1, 1986 through September 30, 1987

Project Title: Information System on Illinois Coal: III. Bibliography of CRSC Projects and Publications

ICCI Project Number: 86-87/3.3A-4

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ABSTRACT

Our main purpose was to build a bibliographic data base of projects funded by the Illinois Coal Development Board (ICDB) and the Coal Industry Committee (CIC) and of publications resulting from these projects. The data base includes citations and abstracts of quarterly reports from current projects and of annual reports from continuing and completed projects; it also includes citations of publications resulting from these projects. Search software, written using the programming language of INFO, permits searching the data base by examining all abstracts from a given publication or by examining only those abstracts from a selected research area. Once the desired abstracts or citations have been retrieved by the user-friendly program, they may be downloaded to the user's microcomputer.

In previous years, the following data bases were established: Information System on the Chemistry of Illinois Coal (ISCIC) and Illinois Basin Coal Sample Program (IBCSP). During this contract year, we provided service to 7 outside users of ISCIC and added chemical results on 30 samples from 15 mines. Minor improvements were made to the IBCSP software. We added to the IBCSP data base the names and project titles of 18 new investigators and 14 others who had previously received samples from the sample bank. We also transferred all data files and programs for IBCSP to a microcomputer. Petrographic analyses were determined on samples IBCSP-5 and IBCSP-6. Mineral matter analyses were determined on IBCSP-6.

EXECUTIVE SUMMARY

The Center for Research on Sulfur in Coal (CRSC) has coordinated several different research projects each year for the past four years at major coal research institutions in Illinois. A wide variety of topics have been and are continuing to be investigated, all of which assist the CRSC to meet its main goals of coordinating, supporting, and promoting coal related research at various institutions in Illinois on topics leading to improved utilization of Illinois coal. Our project has developed an easily accessible data base of past and current research projects; abstracts of quarterly, annual, and Contractors' Technical Conference reports; and publications resulting from these projects and from research involving samples from the Illinois Basin Coal Sample Program (IBCSP).

Objective I: Install and implement a bibliographic data base-management system.

The data base resides on the Department of Energy and Natural Resources' PRIME computer, located on the University of Illinois campus in Champaign. It contains abstracts from Annual Reports, Quarterly Reports, and Contractors' Technical Conferences and citations of refereed publications concerning CRSC-sponsored research.

Objective II: Establish computer-based system to interactively search data bases.

Using menu-driven software, the user may search the data base by looking at entire publications or by selecting papers dealing with one or more specific research areas. Having found the abstracts or citations of interest, the user may examine them on the screen and capture the data on a remote computer.

Objective III: Service and update ISCIC.

We provided assistance to investigators who requested chemical data on Illinois coals and added chemical data to ISCIC on samples from mines that are abandoned or on other non-proprietary samples.

Objective IV: Service and update IBCSP.

We provided assistance to investigators who requested information on samples in the Illinois Basin Coal Sample Program and transferred IBCSP from the University of Illinois' Cyber computer to our office microcomputer. We also performed petrographic analyses on samples IBCSP-5 and IBCSP-6 and mineral matter analyses on IBCSP-6.

OBJECTIVES

This project has four objectives. The tasks to be completed for each objective are as follows:

Objective I: Install an information system of projects funded by ICDB and of publications resulting from those projects.

- Task I-1. Gather information from CRSC on all projects that have been funded by ICDB.
- Task I-2. Formulate a questionnaire to be sent to all researchers. (CRSC completed this task.)
- Task I-3. Gather information concerning publications resulting from or containing data gathered in their ICDB research.
- Task I-4. Build data base of projects funded on the Department of Energy and Natural Resources PRIME computer.
- Task I-5. Build data base of publications on the PRIME computer.
- Task I-6. Obtain abstracts of all final technical reports.
- Task I-7. Obtain abstracts of all current quarterly reports.
- Task I-8. Obtain programs with abstracts of all Contractors' Technical Conferences.
- Task I-9. Enter abstracts obtained into data base on the PRIME computer.

Objective II: Provide system to allow interactive searching of this data base.

- Task II-1. Write menu-driven software in INFO to act as "shell" around various data bases.
- Task II-2. Implement system on the PRIME computer.
- Task II-3. Write user's manual and make information system available to Illinois coal researchers and CRSC.

Objective III: Service and update the information system on chemistry of Illinois coals (ISCIC).

- Task III-1. Update coal chemistry data files, proof and edit new results. Append non-proprietary results to the ISCIC data file.

Task III-2. Service requests for data and new computer accounts from Illinois coal researchers.

Objective IV: Service and update the information system on the Illinois Basin Coal Sample Program (IBCSP).

Task IV-1. Transfer IBCSP data files and programs from the University of Illinois' CYBER computer and implement them on a microcomputer; develop procedures for remote access to IBCSP on the microcomputer.

Task IV-2. Enter results of projects undertaken with coal samples from IBCSP into the IBCSP information system.

Task IV-3. Service requests from Illinois coal researchers for data. This task includes the determination of petrographic and mineral matter analyses of new samples.

INTRODUCTION AND BACKGROUND

Information System on Illinois Coal (ISIC) was begun in 1984 as a multiphase project to construct a data base of items pertaining to Illinois high-sulfur coal and the effort to reduce the level of sulfur emissions from burning of this coal. Phase I, Information System on Chemistry of Illinois Coal (ISCIC), built a data base of available non-confidential analyses of Illinois coal and made it available for on-line searches on the University of Illinois' CDC CYBER-175 computer. Phase II, Illinois Basin Coal Sample Program (IBCSP), established a data base of chemistry, petrology, and users of samples maintained in the sample bank of IBCSP.

This third phase of the ISIC project had a main purpose of creating a data base of projects and publications of ICDB- and CIC-funded programs. The data base includes titles, abstracts, and authors/investigators and is installed on the Department of Energy and Natural Resources' PRIME computer (located on the University of Illinois campus in Champaign) for easy access via telephone lines and modem. In addition, this project updated and serviced data bases established under Phases I and II and transferred the IBCSP data base to a microcomputer.

BIBLIOGRAPHY OF CRSC PROJECTS AND PUBLICATIONS

BIBLIO is a data base of CRSC publications and of refereed publications from CRSC-sponsored research and from research involving samples from the Illinois Basin Coal Sample Program. Data to be found include abstracts of annual and quarterly reports, abstracts of Contractors' Technical Conferences, and citations of refereed publications. Users can search the data base by means of menu-driven software that looks for entries by research area, year and type of publication, or both.

Three procedures have been written to permit entry and editing of data and searching of the data base. Only the search procedure can be accessed by users; its operation is described in detail in the users manual (Appendix I).

Entry of Data

Entry of data into the data base begins at the computer/paper interface. Paper copies of abstracts are entered into a word-processor file using an optical scanner. Once in the microcomputer, they are edited to correct scanning errors and formatted for transfer to the PRIME computer. Each line of the word-processor file equals a record on the PRIME. Each record must begin with a unique character specifying the type of record. Type codes are shown in Table 1.

Each abstract contains one record identifying the source. As shown in Table 1, that record begins with "N" in column one and contains a letter/number code that uniquely identifies the source and year of the publication. For quarterly reports, the code also contains a numeric designator for first, second, and third quarterly reports (fourth quarterly report is the annual report). Source codes and examples of their use are shown in Table 2.

After all scanner errors have been corrected and extraneous text removed from the file, the file is transferred to the PRIME and entered into the data base.

Editing the Data Base

Much effort has been expended to permit entering of correct data into the data base. However, there is always the possibility that errors can work their way into the abstracts themselves. Thus, although we have checked titles, PIs, and authors when we entered the data, we need the opportunity to edit files without having to rebuild the entire data base.

Abstracts can be edited in the INFO data base with a text editor available on the Prime. In the event that the data base gets extensive bad data, it is possible to rebuild the data base, using original data files that have been archived on a tape backup system on the project microcomputer.

Searching the Data Base

Routines that search for items in the data base are totally menu driven. Detailed procedures for using the software are given in Appendix I, so only a brief outline is included here (see Figure 2 for flow chart of search procedure).

Upon entering the search procedure, the user is first instructed to select a terminal type. If he/she does not know what type to choose, an interactive help facility is available. Having selected the terminal type, the main search menu is displayed. This menu allows the user to

select one of two types of searches - by publication or by research area. A search by publication can also be narrowed to research area within a single publication. Thus, if you know you want a report from a particular research area that appeared in the 1986 Annual Report, you would select the publication search, choose the 1986 Annual Report, and then find only those reports for the research area of interest.

Having retrieved one or a number of abstracts or citations, you can display any of several combinations of information to see what you have selected. Downloading is achieved by capturing information as it appears on the screen. However, users may wish to see portions of what they have found (for example, authors and titles) before downloading the entire file. Consequently, several different combinations of items can be displayed on the screen, ranging from only author to entire citation (including abstract if available).

INFORMATION SYSTEM ON THE CHEMISTRY OF ILLINOIS COAL (ISCIC)

During the year, we provided service to seven outside users of the ISCIC data base. These users obtained proximate, ultimate, and chlorine analyses on certain seams in various parts of the state. One company used the data base at least 20 times to obtain data for its coal-exploration program in Illinois. In addition, we updated the ISCIC data file with chemical results on 30 samples from 15 mines.

ILLINOIS BASIN COAL SAMPLE PROGRAM (IBCSP)

Some minor improvements were made to the programs for IBCSP. The file of IBCSP investigators was updated, with the names and project titles of the 32 persons who received samples from the sample bank being entered, 18 of which were first time users of the samples. The updated records included the project titles and objectives of the investigators.

Petrographic analyses were determined on the whole coal and four mesh fractions of sample IBCSP-5 (Table 3). The results indicate vitrinite is somewhat enriched in the 100 x 200 mesh fraction compared to its abundance in the whole coal; likewise, both inertinite and mineral matter are enriched in the fines (-200 mesh). Petrographic analyses were also determined for the new sample (IBCSP-6) that was added to the bank in December, 1986. This sample is a product from a preparation plant that processes coal from a mine in southwestern Indiana. The petrographic results are given in Table 4. This sample is characterized by containing a relatively high amount of exinite and inertodetrinite, compared to the other samples in the bank. In addition, the mean maximum reflectance of vitrinite (telocollinite) in the sample is 0.54 percent, which is an intermediate value compared to the other samples in the bank. This indicates the rank of the coal is high volatile C bituminous, intermediate between that of IBCSP-5 and IBCSP-2.

All data files and programs for the IBCSP have been transferred to a microcomputer located in room 219 of the Natural Resources Building.

Table 1. Data type codes.

CODE	DEFINITION
A	An author's last name.
B	An author's initials or first name; must immediately follow an A record.
C	A line of the paper's title; maximum of three lines permitted.
D	The editors.
E	Title of book in which collected papers appear.
F	Publisher.
G	Volume, issue number, pages, etc.; must appear just as it will print.
H	Last name of principle investigator.
I	Initials or first name of PI; must immediately follow an H record.
J	Project title; maximum of three lines.
K	Research topic; currently ignored; see code L.
L	Research subtopic (searching is currently done on this record, rather than main topic).
M	A line of the abstract.
N	Abbreviation for source of citation; must be first card in citation; see Table 2 for publication source codes.

Table 2. Publication source codes.

CODE	SOURCE	EXAMPLE
AN	Annual Report	AN84 - 1984 Annual Report
CDB	Quarterly Report, Coal Development Board	CDB286 - Second Quarterly Report to the Coal Development Board for 1986
CIC	Quarterly Report, Coal Industry Committee	CIC385 - Third Quarterly Report to the Coal Industry Committee for 1985
CTC	Contractors' Technical Conference	CTC87 - 1987 Contractors' Technical Conference
NP	New projects initiated during last funding competition	NP87 - New projects funded in September 1987
CB	Citations of refereed papers containing data from Coal-Bank samples	The source is given in the citation itself; it is not included in the code.
O	Citations of refereed papers resulting from CRSC-sponsored research	The source is given in the citation itself; it is not included in the code.

Table 3. Petrographic analyses of whole coal and sieve fractions of IBCSP-5*

Constituent /Mesh /Wt. %	Whole coal 100	+48 20	48x100 28.3	100x200 mesh 22.1	-200 mesh 29.6
Vitrinite	76.5	76.9	78.6	80.5	72.0
Liptinite	3.0	5.5	3.3	2.7	1.4
Inertinite	8.8	5.1	7.4	6.5	11.3
Minerals	11.7	12.4	10.6	10.3	15.3

* Constituents are given on a volume percent basis.

Table 4. Petrographic analysis of sample IBCSP-6*

MACERAL / MINERAL	MACERAL COMPOSITION (VOL %) AS MEASURED		MINERAL CORRECTED		MINERAL FREE	
TOTAL VITRINITE		83.0		80.5		85.7
EXINITE	5.2		5.0		5.4	
RESINITE	1.0		1.0		1.0	
TOTAL LIPTINITE		6.2		6.0		6.4
MICRINITE	0.2		0.2		0.2	
MACRINITE	0.2		0.2		0.2	
SEMIFUSINITE	4.0		3.9		4.1	
FUSINITE	0.2		0.2		0.2	
INERTODETRINITE	3.0		2.9		3.1	
TOTAL INERTINITE		7.6		7.4		7.9
PYRITE	2.0		2.0			
OTHER MINERALS	1.2		4.1			
TOTAL MINERAL MATTER		3.2		6.1		
CALCITE OBSERVED	YES					
SULFIDES OTHER THAN PYRITE OBSERVED	NO					
BASED ON TOTAL COUNT OF: 500						
REFLECTANCE (VITRINITE A):	0.54 % MEAN MAX. IN OIL, > 50 READINGS 0.044% STANDARD DEVIATION					

* SPRINGFIELD COAL, FROM SOUTHWESTERN INDIANA; PREPARATION PLANT (JIG & CYCLONE) PLANT PRODUCT, 1.5 INCH TOP SIZE; LAB NO. C26123.

Table 5. Report of mineral matter in coal

SAMPLE NO: IBCSP 6 LAB NO: C26123
LOCATION: SOUTHWESTERN INDIANA
COAL SEAM: SPRINGFIELD (NO V) THICKNESS REPRESENTED (ft): 5.5
SAMPLE DATE: 12-09-96 COLLECTED BY: RDH & DDC MATERIAL: COAL
SAMPLE TYPE: RUN OF PREPARATION PLANT
REMARKS: A JIG & CYCLONE TYPE OF PLANT GIVING A 1.5" PRODUCT

RESULTS , DRY WEIGHT %*

ORGANIC MATTER: 88.5
MINERAL MATTER: 11.5

STANDARD CHEMISTRY (DRY WT %)

ASH : 9.11
PYRITIC S: 1.90
TOTAL S: 3.77

PARR MINERAL MATTER: 11.91

MINERAL COMPOSITION (WT % OF SAMPLE)*

QUARTZ : 1.3
PYRITE : 3.6
CALCITE : NIL
ILLITE : 2.4
SMECTITE : 1.4
KAOLINITE: 2.8

PYRITE : 2.35 (XRD)

OTHER OBSERVED
MINERALS: MARCASITE (TRACE)

* Methods: Mineral matter by low temperature ashing; quartz & calcite by XRD; pyrite calculated from Pyritic S (by ASTM methods); clay minerals: illite, smectite, kaolinite by XRD of the clay fraction and their percentages adjusted to make up the difference remaining from the total mineral matter.

ANALYST: D. LOWRY DATE OF ANALYSIS: 7-23-87 PROJECT: IBCSP
REQUEST NO: 18751 ILLINOIS STATE GEOLOGICAL SURVEY

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NAN84   <--line showing new entry and source (1984 Annual Report)
AHarvey   <--author's last name
BRichard   <--author's first name
ADeMaris   <--author's last name
BPhilip J.   <--author's first name and initial
CSulfide mineral grain-size and maceral associations   <--abstract
Cin Illinois coals and their washed products           <--/  title
Gp. 1-1   <--location in source
HHarvey   <--principle investigator's last name
IRichard   <--principle investigator's first name
JSulfide mineral grain-size and maceral associations   <--project
Jin Illinois coals and their washed products           <--/ title
KCoal characterization   <--research topic
LPhysical characterization   <--research subtopic
M     A method and procedure was developed to characterize the size
Mand maceral-mineral association of sulfide grains (mostly pyrite,
MFeS2) in coal for the purpose of evaluating dependencies of these
Mphysical . . . .   <--last line of abstract
NAN84   <--line beginning new entry
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Figure 1. Annotated example of coded data file.

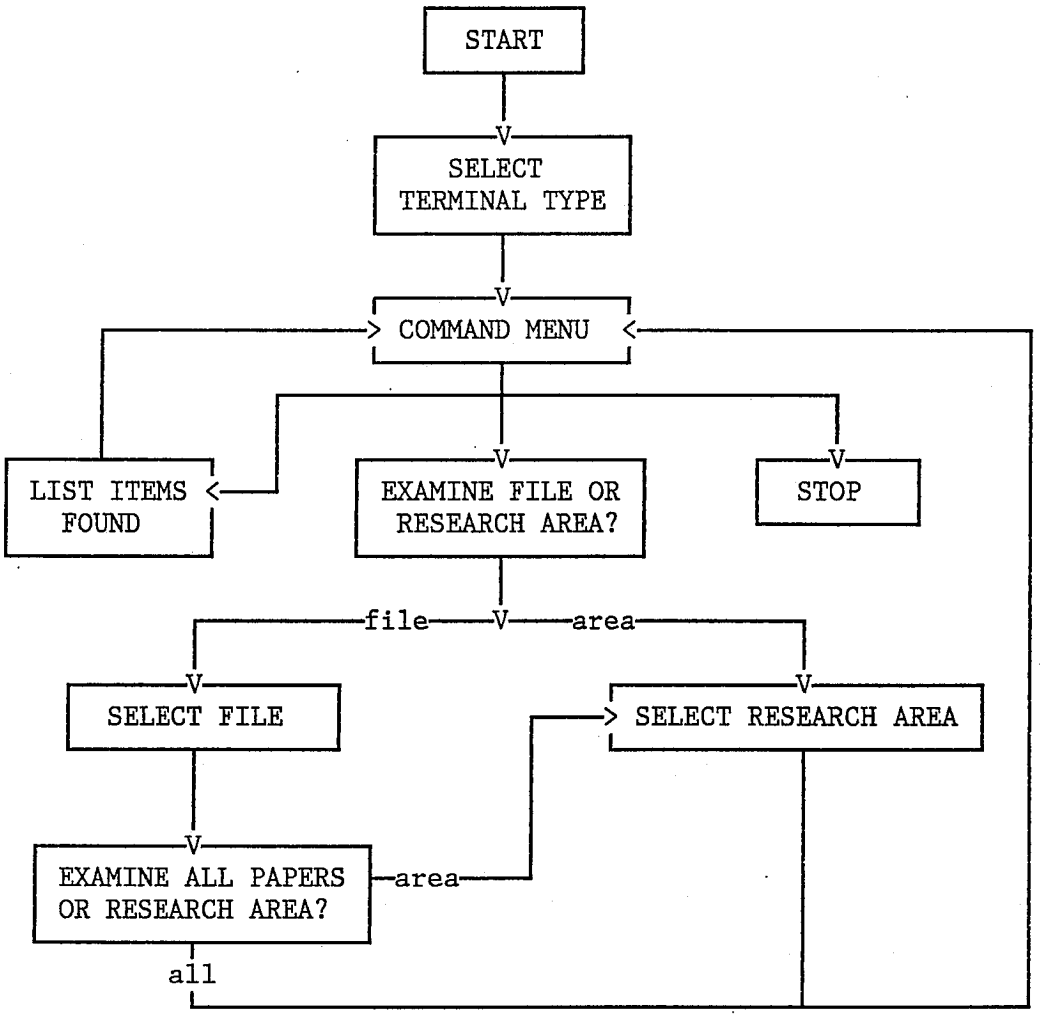

Figure 3: Flowchart of search procedure.

Appendix I.
Guide to Using BIBLIO

The data base of publications issued by the Center for Research on Sulfur in Coal (CRSC), of refereed papers resulting from CRSC-sponsored research, and of publications containing data from the Illinois Basin Coal Sample program resides on the Department of Energy and Natural Resources' Prime computer located on the University of Illinois campus in Champaign. This guide explains the type of information available and gives instructions on using the search procedures.

CRSCPUBS is an interactive search procedure that permits the user to search BIBLIO for items of bibliographic information. The software is written in the INFO programming language and is totally menu-driven. Consequently, it is not necessary to have experience with INFO or the Prime computer to use and retrieve bibliographic information from BIBLIO.

Data Available in BIBLIO

Several items of bibliographic data are available. They can be broken into publications issued by CRSC and refereed papers published in outside journals and books.

CRSC issues two types of publications each year - technical reports and Abstracts of Papers for the Contractors' Technical Meeting. Technical reports include CRSC Annual Reports and quarterly reports of projects funded through CRSC by the Illinois Coal Development Board (ICDB) and the Coal Industry Committee (CIC). ICDB and CIC reports are combined into one Annual Report but were issued as separate quarterly Technical Reports through 1986.

The data base contains authors, titles, abstracts, principle investigators, project titles, research areas (keywords), and source publications for all CRSC reports. Only the abstract is absent from citations of outside refereed papers.

Signing onto the Prime Computer

The Prime minicomputer can be accessed via modem from any terminal or microcomputer. The following settings are necessary to communicate with the Prime:

Baud rate:	300/1200
Parity:	Even
Word length:	7
Stop bits:	1

Having set these parameters, access the Prime through one of the following telephone numbers:

(217) 333-4466 (1200 BAUD only)
(217) 244-0188 (300 or 1200 BAUD)

Having connected with the computer, enter two carriage returns. If the carriage returns do not register or print as "~" on the screen, it means there are no ports available; at this time, dial the other number. If both carriage returns register, enter the following underlined characters in response to the non-underlined messages from the Prime.

LOGIN
User id? _____
Password? _____

You will now receive a several-line logon message from the Prime, culminating in "OK,". After the last OK, enter CRSCPUBS.

This command puts you in INFO and runs the search procedure. After a welcoming message, you will be prompted for the type of terminal you are using. A list of terminal types is available by entering LIST. This list is also shown in Table I-1. If you do not know the type to use, enter HELP for an interactive procedure to select the appropriate type for your terminal/computer.

You will now see the main search/display menu. Upon first entering the search routine, you would choose one of the "SELECT..." commands to search or one of the "DISPLAY ALL..." commands to see what is in the data base.

Choosing SELECT FILE displays a menu that permits searching for abstracts/citations in only a single publication. It is then possible to select a given research area (Figure I-1) within that publication or to look at all abstracts/citations from the publication.

Selecting SELECT RESEARCH AREA first permits examining abstracts and citations in a given research area from all files. If EXAMINE FILE is selected first, SELECT RESEARCH AREA permits examining citations from the chosen file only.

Other selections permit searching for certain principle investigators, authors, projects, or citations. Each of these will first list to the screen what is in the data base and permit you to choose the one(s) wanted. CAUTION: SELECT CITATION generates a lot of information listed on the screen; note that you can stop listing and begin searching by entering "S" at the end of any screen.

You will now be shown the search menu, which permits you to see what you have found, see what is available (this repeats the list you have just examined), to continue searching for items and add to your local data base, to begin searching again (deleting anything you may have already found), or to leave the search routine and look at your local data base according to the list menu.

If nothing is found, you may choose whether to continue searching in the file selected, to move to another file, or simply to search all files.

In any case, you are returned to the main menu where you may begin the search over, list to the screen what you have found, or exit from the search procedure.

Downloading of data is performed by capturing information that appears on your screen. Once you have opened a buffer (or performed whatever other task is necessary for data capture), choose one of the "LIST THE CHOSEN ..." commands from the main menu to permit listing of portions of citations (authors, titles, principle investigators, project titles, abstracts, or several combinations of these) or entire citations.

Having completed your search and data capture, entering 99 at the main menu exits from the search routine but leaves you in INFO. You must then enter Q STOP to exit from INFO. Finally, LO (or LOGOUT) will terminate your session on the Prime computer.

Table I-1. Codes for various terminal types.

CODE	TERMINAL TYPE
ACT-IV	MICROTERM ACT-IV
ACT5A	MICROTERM ACT5A
ADDS	ADDS CONSUL
ADM1	LEAR SIEGLER ADM-1 AND ADM-31
ADM3	LEAR SIEGLER ADM-3A AND ADM-45
ANSI	VT100 IN ANSI-COMPATIBLE MODE
ANSIW	ANSI-COMPATIBLE 132 CHARACTER WIDTH MODE
AREG	ADDS REGENT 20,25,40,60,100,200 (ALSO TELERAY)
BEEH	BEEHIVE, PT-45
CONCEPT	HUMAN DESIGN SYSTEMS CONCEPT 108
CYBERNEX	CYBERNEX
DGRX	DATAGRAPHICS 132A
DMED	DATAMEDIA ELITE 1521
HARD	ANY HARDCOPY WITH FORM FEED
HONW	HONEYWELL VIP 7200
HP2621	HEWLETT-PACKARD 2621
I304	INFORMER 304
IBM1	IBM 3101
LYNW	LYNWOOD
NEWB	NEWBURY
NONE	ANY HARDCOPY TERMINAL WITHOUT FORM FEED
OWL	PERKIN ELMER, OWL, FOX, BANTAM
PST100	PRIME PST-100
SOROC	
TVI924	TELEVIDEO 924
VCRG	VOLKER-CRAIG 404
VT52	DECSCOPE VT52
SEIKO	SEIKO GRAPHICS TERMINAL
DGRB	DATAGRAPHICS 132B
DMD3	DATAMEDIA ELITE 3000 SERIES
HAZE	HAZELTINE 1510
I100	INFOTON 100
I400	INFOTON 400
SORO	SOROC, TELEVIDEO 920, 925
V414	VOLKER-CRAIG 414

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CHOICE OF RESEARCH AREAS:
      Coal Cleaning (sulfur, other noxious elements)
           1    Chemical coal cleaning
           2    Microbial coal cleaning
           3    Physical coal cleaning
           4    Guest speaker in Coal Cleaning
      Fuels and chemicals from coal
           5    Clean chars
           6    Gasification, with or without liquid by-products
           7    Solid-water slurries
           8    Guest speaker in Fuels and Chemicals
      Combustion
           9    Combustion of new fuels
          10    Erosion and corrosion in fluid bed combustors
          11    Guest speaker in Combustion
      Coal Characterization
          12    Organic sulfur characterization
          13    Chemical characterization
          14    Physical characterization
          15    Guest speaker in Coal Characterization
      Related desulfurization studies
          16    Comparative economic evaluations
          17    Fuel marketing survey
          18    Guest speaker in Related Studies
      Gas cleanup
          19    Hot gas cleanup
          20    Guest speaker in Gas Cleanup
      Other Activities
          21    Other research and support activities
          22    Guest speaker in Other Activities
          99    RETURN TO MAIN MENU
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Figure I-1: Secondary menu to pick research area and topic.