

**ANNUAL PROJECT REPORT
AS OF DECEMBER 2001**

1. PROJECT SPONSOR:

CONSOL Energy Inc.
Research & Development
4000 Brownsville Road
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2. PROJECT MANAGER:

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3. OCDO GRANT NO. CDO/D-00-4

4. PROJECT UPDATE X **OR**
FINAL REPORT _____

5. PROJECT TITLE: Landfill Cost Model for Coal Combustion Products (CCPs)

6. PROJECT TERM: FROM: July 1, 2001

TO: July 31, 2002

7. BUDGET:

CO-SPONSORS NAME	COST SHARE
OCDO	\$ 54,430
CONSOL Energy Inc.	\$ 49,710
GAI Consultants	\$ 2,640
Trumbull Corporation	\$ 2,080
TOTAL PROJECT COST	\$108,859

I. ABSTRACT

8. OVEVIEW OF PROJECT & OBJECTIVES:

The objective of the project is to develop a landfill design and cost computer model that predicts both the capital and operating costs of new landfills for Coal Combustion Products (CCPs) disposal. The model shall be publicly available and shall be designed with a high degree of flexibility to provide accurate estimates under a variety of possible scenarios. It will encompass regulations specific to the State of Ohio and will include design and cost algorithms to account for different land topographies and FGD sludge types.

Landfills for Coal Combustion Products are reaching their maximum capacities and coal users are experiencing increased costs to dispose of the waste products. The opening of new landfills under stricter state regulations may result in even higher costs to the utility. This model will define those costs and may provide economic initiative to investigate alternative technically sound, environmentally safe, and commercially competitive uses of CCPs other than landfills.

9. WORK DONE AND CONCLUSIONS:

Information was compiled on landfill design and the regulatory requirements for permitting, constructing, and operating a landfill. Regulations from Ohio, Pennsylvania, and Kentucky were reviewed, and features were included in the model to allow the user to select options that meet a particular state's regulations.

Landfill design principles were established in conjunction with GAI Consultants. Capital costs and cost ranges associated with each step of construction were analyzed and the variables that affect these costs were identified. The option of three terrains, i.e. flat, valley, and side hill, for the landfill design were incorporated in the model. The design parameters and cost algorithms were integrated into the model to provide an initial capital cost estimate for a proposed landfill. Given the required volume of waste material for disposal, the area (acreage) of the landfill was calculated based on the type of topography selected, standard engineering practice for limits on height of fill, maximum allowable slopes for stable cuts, and intermediate and final cover requirements. The area was then used to calculate the cost.

10. PLANS FOR COMING YEAR:

The following tasks will be carried out: 1) Incorporate into the model the methodology to estimate the volumes of various CCPs generated based on a power plant size and user-specified information. 2) Work with Trumbull Corporation to develop the operating and maintenance costs of both new and existing landfills. 3) Complete the development of the model in Microsoft Excel/Visual Basic for Applications programming platform to provide a user-friendly model. 4) Validate the model. 5) The final task will be to provide written documentation of the model and disseminate it to potential users. A technical paper that describes the model and its features will be prepared and submitted to appropriate organizations for presentation at a conference or publication in an industrial

magazine. The information will also be distributed in coordination with the Ohio Coal Combustion Products (CCP) Pilot Extension program at The Ohio State University.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. A step-by-step approach was developed to predict capital costs of new landfills for Coal Combustion Product (CCP) disposal. Key factors were identified and incorporated into the computer model. State regulations were evaluated and included in the calculations. Defaults were established so that limited information is required from the user, while allowing flexibility if detailed information is available. The regulations and construction costs are integrated with landfill geometry to provide a variety of conditions for the user to evaluate. These costs will assist in evaluating economics for alternative utilization of the CCPs.

III. ARTICLES/PRESENTATIONS

12. None