NEEMIS
TEXT OF GOVERNORS PRESENTATION
of October 6, 1975
Given by
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Energy Laboratory in Association with the
Alfred P. Sloan School of Management
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ABSTRACT

This is the text of a presentation given to the six New England governors on November 7, 1975. The presentation focused on explaining how the New England Energy Management Information System (NEEMIS) has helped the region, what it is, how it will continue to help the region, what unique technology made it possible, what shall be done in the future, and a demonstration of one application.

NEW ENGLAND ENERGY MANAGEMENT INFORMATION SYSTEM [1]

W. Robert Keating
New England Regional Commission

John J. Donovan
M.I.T. Sloan School of Management

Thank you Mr. Merriman.

Governors, Mr. Cochairman, about one and one half years ago, the
Energy Staff of the New England Regional Commission began to collect and
analyze energy data in a simple and rather primitive manner. Because we
had better data than the Federal Government, those first efforts resulted
in increased petroleum product allocations to two New England states --
Massachusetts and Maine. To further increase the region's capability to
analyze data, the New England Regional Commission initiated and supported
the development of a facility called the New England Energy Management
Information System (NEEMIS).

As our capability increased, we were able to document the highly
negative impacts on the New England economy of the Administration's Energy
Program. Those impacts were greater than originally projected by FEA in
Washington. Our data, being more current and more accurate, eventually in-
creased Washington's sensitivity to New England problems. One specific
example is the Entitlements Program which saved New England consumers an
estimated $150 million annually. Our data collection and analytical capa-
bility also supported the states' law suits challenging the $2.00 tariff
levied on foreign oil. The challenge -- successful to date -- will save
the New England consumer an estimated $297 million annually.

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[1] This is the text of a presentation given to the six New England Governors
on November 7, 1975. The talk began with Mr. Russell Merriman introducing
Mr. W. Robert Keating of the New England Regional Commission.

Our capability to analyze data and present New England's position to the nation has been increased even more. Today, you will see that enhanced capability and how it can help you individually and collectively support the best alternatives for your state and for the Region.

Dr. John J. Donovan, an associate professor at the Alfred P. Sloan School of Management at M.I.T., who is the principal investigator for NEEMIS, will talk about the Project.

Dr. Donovan's talk will include a brief demonstration of a partiuclar application which will calculate the economic impact to the Region, states and subsectors of various external effects, such as OPEC increases, tariff increases, and decontrol. In order to assist us in this demonstration, we have asked Governor Noel and his Energy Staff to identify a scenario for which they would like to see the impact. It should be remembered that the results of this demonstration is not a prediction of what will happen but a measure of the economic effect on the Region should these series of events take place. I shall also handout to all of you a copy of the questions that we have asked the State of Rhode Island to answer.

NEEMIS [1]

Governors Noel, Salmon, Grasso, Thomson, Dukakis, Longley, and Federal Cochairman Merriman, I'm here to talk about the New England Energy Management Information System, or what we call NEEMIS. Specifically, I'm going to try and cover:

1. What NEEMIS is;
2. How NEEMIS can help you;
3. How we produced NEEMIS,
4. What we plan to do in the future.

Previous discussions on this Project with members of your Energy Staff have taken many hours. We have tried to compress our presentation down to 6 slides as we realize the commitments on your time. Our doors continue to be open as they have in the past to you and to your staff for further discussions.

1. What is NEEMIS

What is NEEMIS? NEEMIS is a computer facility that includes a capability for: data management (storing, retrieving, protecting, and validating data); for performing analytical functions on data; and for presenting results of analyses and data.

NEEMIS presently contains a number of data series relating to energy collected by FEA Region I, previous NERCOM efforts (e.g., ADL), and others. The NEEMIS facility has been applied to constructing a number of programs to assist in analyzing various energy policy decisions as outlined by NERCOM and the State Energy Offices.

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[1] Opening of Professor Donovan's presentation.

Therefore, NEEMIS can be viewed as three things: (1) a facility (which is analogous to carpenter tools); (2) several data series (which are analogous to materials); and (3) application programs (which are analogous to individual houses). NEEMIS is first and foremost a facility that can be used to construct many applications programs quickly and inexpensively, just as good carpenter tools can construct many different houses.

2. How NEEMIS can Help You

These tools can be used by your staff in many ways. I am not going to dwell on the tools but rather will emphasize the types of answers you can get using applications programs constructed with these tools.

Example Application:

The application we shall demonstrate today is one that calculates the economic impact to the Region, state and subsector of various external events, e.g., OPEC price increases, tariff increases, decontrol. This NERCOM procedure was originally implemented in conjunction with the Massachusetts Energy Office using the NEEMIS capabilities. The data that the procedures use were collected under previous NERCOM efforts. It is important to keep in mind that this is "only one house" that has been built using these tools. The tools were such that this application was able to be built quickly (in a matter of a week's time), and the calculations performed now take a matter of seconds instead of days or weeks (as with the manual system).

During the talk, the operator will input Governor Noel's assumptions to this program into an IBM computer located at Cambridge. Namely, his assumptions are:

- The scenario is for the State of Rhode Island and
  New England.

- Assume the OPEC price increase per barrel will be $1.05 (2)
  over the present world price of $14.15.

- Assume that a tariff on imported crude will remain as is,
  namely, $2.00 per barrel or _0_ increase.

- Assume that the tariff on imported product which was
  $.60 per barrel and has recently been eliminated will
  remain eliminated.

- Decontrol of oil will start December 1975 and continue
  over a period of 40 months or 2.5% per month.

Before the end of the talk, the computer will produce a report of the

economic effect that these events will have if they should occur for the

month of December 1976 for the state of Rhode Island and New England.

Note that the program to make this computation ultimately could be

quite complex, e.g., calculation of effect of entitlements program, fore-

casting shifts in consumption patterns with changes in price, etc. Further,

note that the data used in the calculations must be previously analyzed in

a sophisticated manner.

Therefore, we needed a sophisticated data management capability and a

good analytical capability to build this application.

To keep you all here, the answers will be ready at the end of my talk.

Other Application Programs:

We should stress again that NEEMIS is a capability that can be applied

by your State Energy Offices, NERCOM, and other energy agencies to problems

facing them and you.

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(2) These underlying parameters were given during the presentation by
Governor Noel as a possible scenario in which he was interested.

Recognizing time constraints, let me briefly touch upon a few other application programs that have been created and reside on secondary storage. For each of these applications, the hardware configurations remain the same; the change occurs in the data and programs needed.

- Economic impact analysis (the demonstration of today).

- Conservation -- Two of the several analyses on conservation that are underway include: (1) Working in conjunction with the Massachusetts Public Housing Authority who have a large expenditure per year in heat and utilities; (2) In conjunction with the State of Connecticut's Energy Office, consumption monitoring of State buildings is underway.

3. How We Produced NEEMIS

The NEEMIS facility has been developed at M.I.T. under the guidance and direction of the New England Regional Commission and in close cooperation with the State Energy Offices. (For example, Lynn Brooks from Connecticut has previously served as a chairman of a subcommittee on this project.) In order to build the flexible type of management information system desired and needed by the Region, it was necessary to implement some of the newest software techniques available as well as develop others. This has been made possible by a Joint Study Agreement between M.I.T. and the Cambridge Scientific Center of IBM. This arrangement has allowed an integration of our scientific work at M.I.T. and some important work on software at IBM; this cooperation plus access to IBM's computer facilities have made possible the development of these advanced software technologies. We in the Joint Study are very excited about these developments. I am only sorry we do not have the time to speak about them in detail.

Hardware Architecture:

The hardware configuration that NEEMIS uses consists of: computer terminals (which are available to State Energy Offices); ordinary telephones, which are connected to the terminals by way of a data set; an IBM 370 Model 158 computer located at the IBM Cambridge Scientific Center made available to us through the IBM/M.I.T. Joint Study Agreement; and secondary storage devices.

They key components of the system, however, are the programs (software), which are sets of instructions that reside in the computer's memory. The collection of these programs that provide the tools for handling data, constructing application programs (e.g., the one we are demonstrating), and integrating existing programs we call the GMIS (Generalized Management Information System) System. [1] The application of these tools to New England energy problems we call the NEEMIS System.

What is Unique:

Most computer systems are concerned with operational aspects. For example, computing payroll, taxes, bills, etc. This system is concerned with supporting policy decision making. What is different about such support is that:

- problems are not known long in advance

- problems keep changing

- solutions are needed in a short time frame.

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[1] For further information the reader may refer to three documents:

- "GMIS: An Experimental System for Data Management and Analysis,"
    M.I.T. Energy Laboratory Working Paper No. MIT-EL-75-011WP.
- "GMIS Primer," M.I.T. Energy Laboratory Working Paper No. MIT-EL-75-012WP.
- "NEEMIS," M.I.T. Energy Laboratory Working Paper No. MIT-EL-75-015WP.

Therefore, we must build on existing programs. We cannot require new training of personnel for computer languages. The NEEMIS system was specifically designed to provide the above unique needs of the decision maker. One of the key software technological advances that it uses to do this is by simulating many computers onto one computer and having all these simulated computers inter-connected. Each simulated computer is capable of running any program that is presently running by any computer with little transfer cost. Each simulated computer is capable of running a different modeling or econometric package (e.g., TROLL, TSP, EPLAN, FORTRAN, etc.) even though they may run under incompatible operating systems.

4. **Future**

In the next months, it is anticipated that the NEEMIS System will become even more readily usable by your State Energy Offices as terminals will be installed in their offices that will access the system, data, and existing models, as well as the facility to build new applications.

In conjunction with NERCOM and the State Energy Offices, new energy application programs will be written. During the next year, the performance of the system will be improved most notably in increased response time. Further, additional modeling facilities and report generation capabilities will be added to the system.

The M.I.T. Sloan School's Center for Information Systems Research and IBM will analyze the management implications of this system.

The Sloan School and NERCOM will identify other applications of this system in areas where public policymaking or strategic planning issues can be assisted by such a capability (e.g., management of educational programs, health care, etc.).

NERCOM and M.I.T. will disseminate information through various work-
shops, conferences and publications to your State Offices and to other
State agencies that can use such a capability, as well as to others that
have expressed needs and a desire to learn about what we are doing.

5. Results of Scenario

While I've been talking, the computer has produced the following
response to the assumptions of Governor Noel of Rhode Island and cumulated
those results forthe entire New England Region. These results may be used
by you to assist in your response to Washington if those assumptions
become likely.

The computer operator's inputs are shaded. Figure 2 depicts the inter-
actions with the computer while inputting assumptions. Figure 2 depicts
the output for the region. Figure 3 depicts the output for Rhode Island.

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I SEC
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WELCOME TO THE INTERACTIVE SYSTEM FOR COST ESTIMATION.

FIRST, ELECT OPTIONS.
ENTER TWO LETTER CODE FOR STATE:
NE

OPEC
GIVE ESTIMATE:
[]:
```
1 . 5
```
← *Estimate of OPEC price increase*

CRUDE
GIVE ESTIMATE:
[]:
```
0
```
← *Crude tariff increase*

PRODUCT
GIVE ESTIMATE:
[]:
```
60
```
← *Product tariff*

DECONTROL
START MONTH(EG 75 11)
[]:
```
75 12
```
← *Assume decontrol will start December '75*

PERCENT PER MONTH:
[]:
```
2.5
```
TARGET MONTH:
[]:
← *Assume decontrol will be spread over 40 months*
```
76 12
```
← *Wish to know effect for December '76*

START OF OUTPUT:

Figure 1.   Input Assumption

<u>NEW ENGLAND</u>

1. INCREASED COST TO AVERAGE FAMILY (PER YEAR, BASED ON
1)00 GALLONS OF GASOLINE,
1300 GALLONS OF HEATING OIL AND
5300 KWH ELECTRICITY CONSUMPTION PER YEAR:)

GASOLINE:	$46	INCREASE
HEATING OIL (DISTILLATE):	$56	INCREASE
ELECTRICITY:	$7	INCREASE
TOTAL:	$109	INCREASE

Effect on average homeowner

2. INCREASE/DECREASE IN COSTS FOR FOUR MAIN SECTORS:

COMMERCIAL:	DISTILLATE	$65,411,886
	RESIDUAL	$33,615,543
	ELECTRICITY	$20,982,338
	TOTAL	$120,009,767
INDUSTRIAL:	DISTILLATE	$16,913,681
	RESIDUAL	$19,078,775
	ELECTRICITY	$22,848,637
	TOTAL	$58,841,093
RESIDENTIAL:	DISTILLATE	$113,248,835
	RESIDUAL	$0
	ELECTRICITY	$27,678,329
	TOTAL	$140,927,164

TRANSPORTATION INCREASE: $19,311,750

TOTAL IMPACT (INCREASE): $339,089,774

Total effect on all New England

Figure 2. Output -- Effect of Assumptions on New England

RHODE ISLAND

1. INCREASED COST TO AVERAGE FAMILY (PER YEAR, BASED ON
1000 GALLONS OF GASOLINE,
1300 GALLONS OF HEATING OIL AND
5300 KWH ELECTRICITY CONSUMPTION PER YEAR:)

GASOLINE:	$46	INCREASE
HEATING OIL (DISTILLATE):	$56	INCREASE
ELECTRICITY:	$7	INCREASE
TOTAL:	$109	INCREASE

2. INCREASE/DECREASE IN COSTS FOR FOUR MAIN SECTORS:

COMMERCIAL:	DISTILLATE	$3,472,957
	RESIDUAL	$2,508,765
	ELECTRICITY	$1,765,259
	TOTAL	$7,746,981

Effect on commercial sector in Rhode Island ←

INDUSTRIAL:	DISTILLATE	$827,930
	RESIDUAL	$1,060,217
	ELECTRICITY	$1,872,166
	TOTAL	$3,760,313

RESIDENTIAL:	DISTILLATE	$10,413,436
	RESIDUAL	$0
	ELECTRICITY	$2,057,296
	TOTAL	$12,470,732

TRANSPORTATION INCREASE: $19,311,750

TOTAL IMPACT (INCREASE): $43,289,776

Figure 3: Output -- Effect of ASsumptions on Rhode Island

6. Conclusion

Let me conlcude with three statements. First, let me say that many groups and individuals that have participated in this effort. They include: the NERCOM staff, students and colleagues at M.I.T., your State Energy Offices, FEA Region 1, Massachusetts Public Housing Authority, Boston Energy Office, Port Authority, Coast Guard, your State Tax Departments, the Oil companies servign the New England Region, State Departments of automobile registration, IBM, the M.I.T. Sloan School, the M.I.T. Energy Laboratory, the Sloan School's Center for Information Research and its Corporate Sponsors, the Bureau of Mines, U.S. Cencus Bureau, as well as many other private, state, and federal agencies.

Secondly, a statement of qualification. NEEMIS is a powerful facility, but to answer your questions, the applications must be identified, programs must be written, and the data gathered. The last two tasks have been made considerably easier with NEEMIS.

Thirdly, this kind of capability gives you the ability to present your case to Washington and to your constituents.

If there are any questions, we will be happy to answer them at this time.

Thank you.