

an honorary Doctor of Laws degree from the Michigan Technological University, Houghton, Michigan.

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Dr. HIBBARD. I would like to say I am happy to have the opportunity to explain Project Badger.

There are three very important ingredients. First of all, there is a technological challenge which I think is an extremely important challenge—where you see a way of accomplishing something that you know will make a breakthrough in excavation technology.

Secondly, it involves interagency cooperation. There are nine agencies in the Federal Government interested in this and we are all working together as a team, with a lead agency. In this case it is the Bureau of Mines.

Thirdly, this is a chance to serve society. The mining industry has been for many years scolded for its air pollution, water pollution, land pollution, for being robber barons of natural resources. Here is an opportunity for the mining industry to develop the technology to be used to serve society.

The name of the project is Project Badger. It is a project in rapid subsurface excavation technology. The increasing application of this boring machine, a 20-foot in diameter machine, which can bore a hole in soft rocks represents the beginning of a breakthrough which may be as important to this country as the discovery of dynamite and its use in mining 100 years ago. The usefulness of this machine will go far beyond mining. Indeed, its broad applicability to the many and varied problems of a technological society is a consideration that makes the effort to advance it very rewarding.

The nine agencies working together on this are the Army, Air Force, Atomic Energy Commission, Geological Survey, Bureau of Reclamation, Housing and Urban Development, high-speed transportation, Bureau of Public Roads, water and power agencies and Bureau of Mines.

The geophysical distribution of the kind of problems that the program can be responsive to is shown in this chart. This chart is also in your text following page 14. It affects all areas of the country. It can be used for highways and parking. For example, today we are going into the high-rise development. If you go to Chicago and see the marina, it is a circular cylinder going up in the air where parking is on the first 13 floors and apartments on the next 13 floors. I think the trends in the future will be to go underground. We have used up much of our urban upper space so we will have to tunnel highways, parking areas and living space underneath the earth. We are going to have urban rapid transit underground. We are going to have urban utilities: we are going to have high speed intercity transportation, water tunnels, sewage tunnels, power tunnels, oil and gas pipelines, defense, atomic energy installations; and, of course, the continuation of mining underground. So the tunneling, in fact, is going to have a large impact. It is going to be in a sense a renewal of Jules Verne.

Two examples I would like to mention very quickly. There has been a study of the commuter problem in Los Angeles. Everyone who has commuted there in the morning knows it is really rugged. The thought is they could build 1,000 lane-miles of commuter roads underground as tunnels, saving surface space, solving the pollution prob-