

lem and, in addition, developing parking space underground: From the standpoint of getting to work you would come up to the surface and work in an office building and have a view of reviving natural beauty rather than the concrete landscapes many of these highways have produced.

A similar situation exists in Chicago. There they would need an estimated 1,300 miles of tunneling. Chicago is talking about putting their airport 5 miles out in Lake Michigan and having a commuter system back and forth to this platform from the shore. These are the kind of things which will be involved.

All in all, we can identify at this stage of the development potentially 13,000 miles of tunnels to be driven for these various purposes. And here on this chart (p. 47) is the estimated growth in need for subsurface excavation during the next 15 years for urban highways; mass transit, and others; including water, sewage, power. These are annual figures estimated over 15 years from now to the \$21½ billion spent annually in 1982 for this purpose. Incidentally, the figures are derived from the 9-agency study so the input is across the board.

The estimated cumulative cost of subsurface excavation during the next 15 years is shown here on this chart (p. 48). It is shown with research and development to total \$11 to \$12 billion and without research and development totaling \$20 billion.

In other words, if we continue with the evolutionary kind of technological development which is occurring now in this field, the cost of this tunneling will be about \$20 billion on a cumulative basis.

We believe that with a properly focused enthusiastic research and development program, we can cut as much as \$8 to \$9 billion from the cost of these tunnels. Most of these tunnels will be paid for by the public, by public utilities. Therefore, this advantage of \$8 billion could accrue to the public, to the taxpayer. Therefore, it is an appropriate kind of research and development program for the Government to undertake.

In actual fact the experience with the development of this technology, I think, illustrates the point here. On this chart (p. 14) is the historical and projected development of tunneling technology over the years. Starting in 1850, the initial mining efforts, I think if I may just show you this picture—there were a group of men who had hammers and chisels and were single jacking. Then we devel-