

TESTIMONY

of

THE AMERICAN ENGINEERING ASSOCIATION

on

***PROJECTIONS OF SCIENCE & ENGINEERING PERSONNEL
REQUIREMENTS:***

HOW GOOD ARE THE NUMBERS?

as presented to

SUBCOMMITTEE on INVESTIGATIONS & OVERSIGHT

of the

HOUSE SCIENCE, SPACE & TECHNOLOGY COMMITTEE

April 8, 1992

by

BILLY E. REED, PRESIDENT

INTRODUCTION

The American Engineering Association is a non-profit corporation with membership in virtually every high-tech center in the United States. We were founded in 1979 to improve engineering and related professions in the area of professional issues. We are dedicated to the enhancement of the engineering profession and U.S. engineering capabilities.

AEA is the only engineering association dedicated exclusively to the professional needs and concerns of the U.S. engineering community. Among these concerns is what we have termed Engineering Shortage Propaganda or ESP.

AEA believes this nations engineers are a valuable resource and as such should be nurtured. It is to this end we offer the following testimony.

I am Billy E. Reed, President of the American Engineering Association. I want to thank the Chairman and the Subcommittee for the opportunity to present our views on this very important issue.

I do not claim to be an expert in static modeling, nor do I know much about how the National Science Foundation operates. There are others here who are more qualified in both of these areas than I. There are problems within the National Science Foundation which I believe are both systemic and very harmful to the engineering profession.

Working level engineers consider the National Science Foundation a very anti-engineer organization. Engineers find this appalling considering our tax dollars fund NSF. This attitude, while perhaps not justified across the entire organization, is based on more than just a gut feeling.

For example, in 1983, the American Engineering Association was working to require foreign engineering students to return to their homeland before being granted permanent residence status to remain here to work. Our amendment was to be introduced by the Hon. Sam B. Hall of Texas and during one conversation with his immigration aide I was told "The pressure against this amendment is incredible. Every member of the Fortune 500 as well as the National Science Foundation has been lobbying us to drop the amendment."

After more discussion, I was told Rep. Hall's office had received several calls from people within the NSF who indicated Mr. Erich Bloch, the then Director of NSF, had asked them to call. I have no reason to not believe Mr. Hall's aide.

Typical of the predictions of engineer shortages was perhaps the most widely quoted "source" of recent times, the American Electronics Association survey which gained prominence in 1983. AEA determined there was going to be a shortage of engineers by surveying themselves. This report was embraced and quoted by everyone from members of Congress to the National Science Foundation, to virtually every trade journal and newspaper in the country to "prove" there was going to be a "crisis level" engineering shortage.

Only after several years of quoting their survey and receiving a significant amount of criticism did AEA admit their survey only indicated a "shortage of electronic engineers" and should not have implied a "shortage of all engineers". In early 1986 Pat Hill Hubbard of AEA finally admitted "the electrical engineering shortage no longer exists".

Ms. Hubbard described an article in the AEA publication "Update" which still maintained there was a shortage of engineers as an "unfortunate editorial misrepresentation" and a problem of "semantics".

The May 12, 1986 issue of Electronic Engineering Times carried a story which makes the following statements: "A high-ranking National Science Foundation official (Mr. Nam Suh) told engineering vice presidents here last week that America engineers are overpaid and less productive than their foreign counterparts." The article goes on to state "When pressed later to clarify his remark, Suh said bluntly "Yes, I think American engineers are overpaid.'" Mr. Suh was the assistant director for engineering at NSF at the time.

The article continues "In his speech.....Suh said there is a shortage of engineers, a contention with which few engineering groups concur."...."He told EE Times afterward. "We need to improve the quality of them and the number of them." I believe the term "them" is very telling of the attitude of not just Mr. Suh, but the NSF. Engineers are not a "them" or a product to be bought, sold or traded. To his credit, Mr. Bloch reportedly refuted both the "overpaid" and "shortage" statements of Suh.

If you believe academia and corporate management, there has been a "crisis level" engineering shortage for the last forty five years. The following quotes illustrates my point:

"Since 1947 the number of scientists and engineers employed has gone from 575,000 to 900,000, the Chase Manhattan Bank points out....Engineers now start at \$400 per month in contrast to less than \$250 nine years ago. It is estimated that there is a current need for 45,000 engineers a year. We graduate only 23,000. Four hundred men trained as nuclear scientists graduate each year. Twelve hundred are needed."

"The most challenging aspect of the problem lies in the fact that today only 16% of university students major in science and engineering, down from 25% since 1950, while in Russia over one-third of all students major in engineering." Does this sound familiar? This quote came from Forbes Magazine May 11, 1981 quoting from an article that appeared there in 1956. Nearly forty years and the story is the same.

For the entire decade that I have been involved in these issues, we have not produced enough engineers in our schools according to management and academia, yet the Bureau of Labor Statistics has indicated that some twenty percent of each years graduating class never enter the engineering workforce.

Supporting evidence is found in a report by OTA released in 1986 titled "Demographic Trends and the Scientific and Engineering Work Force". The report states "Less than two thirds of science and engineering baccalaureates produced in recent years have actually become a part of the science and engineering workforce."

The report concluded even though the college age population was expected to decline by 22 percent between 1982 and 1995, the market would draw from that third which had never entered the engineering workforce.

The NSF report which brought about these hearings "Future Scarcities of Scientists and Engineers: Problems and Solutions" as I understand it was never "officially" released and presumably was never an "official" position of NSF.

This report was quoted extensively in Rep. Morrisons immigration hearings and in fact was the basis for nearly tripling the number of foreign engineers and scientists who potentially are to be admitted to the United States. Every one was aware of the deep reductions in defense except perhaps Congress and the NSF.

The NSF report has been criticized and discredited by nearly every one who has read it. Someone, however, has forgotten to tell the press. Has NSF ever put out a press conference to withdraw a report? Have they ever said "we were wrong"?

What was NSF's answer to the criticism? They indicated they had never said there was a "shortage" of engineers, they defined it as a "shortfall". My dictionary (Webster's II, New Riverside University Dictionary) defines shortfall as follows: "1. A failure to attain a specified amount or level: SHORTAGE. 2. The amount by which a supply falls short of expectation, need or demand." To an unemployed engineer any difference seems inconsequential.

In late March of 1992 the CNN financial show "Money Line" quoted the latest version of this report suggesting we are facing a crisis level shortage of engineers by the 2010 or so. Less than a week later Money Line also ran a story about the difficult time this years crop of college graduates were having finding a job. One of the professions spotlighted as having the toughest time finding work was engineering.

To return to the systemic problems within NSF, perhaps the main one is the people who run NSF are from management and academia. Both groups have a vested interest in the outcome of the studies. NSF itself has a vested interest in having a shortage. With a projected shortage, NSF is in a better position for additional funding which keeps the bureaucracy expanding. The only loser is the working level engineer who has no representation in the process.

If you believe academia and corporate management, there has been a "crisis level" engineering shortage for the last forty years; yet no major project has been canceled because of a lack of technical expertise. No major project has been a technical failure due to a shortage of engineers. You can speak of the failures of management. (Ref. Divads, the A-12, etc., etc.)

To the best of my knowledge we have never had a "current" shortage of engineers. They have always been five or ten years or more in the future and seem to appear at about the same time as new immigration legislation.

Economics 101 teaches us if a commodity is in short supply the price increases. Engineering salaries have been virtually flat, in terms of common dollars, since at least the mid 1960's. Compare the salaries of engineers to doctors over the last thirty years. There is not now, nor has there ever been a shortage of engineers.

All predictions of engineering supply and demand have several things in common; they are never very accurate and invariably, they overstate the demand and understate the supply. Often they are based on the word of academia and management.

In my thirty plus years in the business, I HAVE NEVER HEARD OF A SURVEY OR STUDY WHICH INDICATED A POSSIBLE SURPLUS OF ENGINEERS. This includes the debacle of the early 1970's when between 60,000 and 100,000 engineers and scientists were unemployed.

What are the results of these surveys and all of the ensuing publicity? Congress holds hearings, panics at the horror stories emanating from management, academia and NSF, and throws hundreds of millions of dollars at NSF and the universities to make us competitive again.

Remember the early 1980's when the universities were lobbying for money to expand our engineering schools, turning away domestic students and at the same time were recruiting overseas for students? Remember the hundreds of millions of dollars NSF received to establish "manufacturing research centers"?

High school students were enticed to enroll in engineering only to find they were unable to get jobs upon graduation, older engineers were laid off and salaries failed to keep up with inflation.

Freshmen enrolling in college see these results and decide law, medicine or business was much more rewarding, stable and probably less work academically. Many will point to demographics as the culprit in declining engineering enrollments. I believe freshmen witnessing the problems of previous graduating classes should bear at least as much responsibility as demographics.

What of the two million or so people who are to become unemployed due to previously announced defense cuts. Every fifth or sixth defense or high tech worker is an engineer. There will be thousands or perhaps hundreds of thousands of technically trained people in the military service who will be returning from overseas to a less than bright future after serving our country so well.

The people making the predictions are concerned only with "keeping the pipeline" full. A full pipeline lets management pick and choose without increasing salaries. A full pipeline lets academia keep the class rooms full and their position safe. A full pipeline "keeps the slaves between the decks."

SUMMARY

There is no bad time to engage in Engineering Shortage Propaganda (ESP). If we have a surplus of engineers, it merely insures "reasonable" salaries for the foreseeable future. If there is a (relatively) tight market, the studies will be useful in further loosening the immigration laws to "keep an adequate supply" of the worlds best and brightest. Of course the academics will stay busy (and employed) producing the next crop of young engineers.

ESP consistently overstates the demand and understates the supply. In spite of the forty years of constant shortage predictions, no projects have been canceled because of a lack of technical talent, no projects have been failures due to a lack of technical expertise.

In forty years one would reasonably expect to have a survey which indicated an oversupply of engineers. If we accept the premise of a shortage, we must then explain salaries which have not increased in real terms since at least the mid 1960's.

There is no shortage of engineers; there has never been a shortage of engineers. It's not possible to have a shortage of engineers if one accepts the law of supply and demand in a free market economy. As the demand and therefore prices increase, the supply will increase to fill the demand and create equilibrium. Our market is being grossly distorted by the shortage shouters.

RECOMMENDATIONS

1. - Require any study or survey to be reviewed by an independent, neutralbody before being released or "leaked" to the public or press. This body should be representative of the engineering workforce.
2. - Require the effects of current market conditions to be considered a part of the overall study or survey as a leveling mechanism.
3. - Require NSF to spend as much in resources and effort "recalling" a faulted report as is spent to publicize the release of the report.
4. - Stop NSF from lobbying Congress on issues such as immigration, etc.. It's one thing to testify on credible, scientific evidence but quite another to spend taxpayer money to lobby for the NSF point of view.
5. - Place working level engineers in areas of responsibility within this process.
6. - Stop funding Engineering Shortage Propaganda. This money could be better spent to create jobs for engineers.

Engineers consider Engineering Shortage Propaganda an issue of the highest priority. Thank you for your consideration of this problem.

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