

THE ENGINEER'S ROLE IN PUBLIC POLICY

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ABSTRACT: The roles that Engineers have taken on goes well beyond the realm of knowledge and technology. Engineering impacts the health and vitality of a nation as no other profession does. The business competitiveness, health, and standard of living of a nation are intimately connected to engineering. As technology becomes increasingly engrained into every facet of our lives, the convergence between engineering and public policy will also increase. This will require that Engineers develop a stronger sense of how technology and public policy interact. The public is playing a much more active role in both private and public projects alike through more open planning processes, environmental regulations, and elevated community expectations that place greater responsibility of those executing project developments. While Engineers have indirectly pursued connections to public policy through lobbying organizations and their own professional engineering societies, the engagement of Engineers in public policy issues has been haphazard at best. It is both the responsibility of the Engineers and important to the image of the profession that engineers make a better connection with public policy in the future. The Engineer of the 21st Century will need to assume leadership positions from which they can serve as a positive influence in the making of public policy and in the administration of government and industry. Essential public policy and administration fundamentals include the political process, public policy, laws and regulations, funding mechanisms, public education and involvement, government-business interaction, and the public service responsibility of professionals.

KEYWORDS: Public policy, Political process, Law and regulations

1. INTRODUCTION

The roles that engineers have taken on go well beyond the realm of knowledge and technology. Engineering impacts the health and vitality of a nation as no other profession does. The business competitiveness, health, and standard of living of a nation are intimately connected to engineering. As technology becomes increasingly engrained into every facet of our lives, the convergence between engineering and public policy will also increase. This will require that Engineers develop a stronger sense of how technology and public policy interact.¹ The public is playing a much more active role in both private and public projects alike through more open

planning processes, environmental regulations, and elevated community expectations that place greater responsibility of those executing project developments.²

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influence in the making of public policy and in the administration of government and industry.⁴ Essential public policy and administration fundamentals include the political process, public policy, laws and regulations, funding mechanisms, public education and involvement, government-business interaction, and the public service responsibility of professionals.⁵

2. THE ISSUE

Why is it that: our neighbors don't know what an engineer is; only four of the United State Congressmen are engineers; only 30% of the United States' Secretary of Transportations are engineers; and that there are major U.S cities and other cities around the world with City Engineers who are not engineers, yet hold the title? When you ask someone what an engineer is you will usually be given a description of a person in dirty overalls who fixes cars or worse yet, the person in the hotel who comes up to fix the television or the plumbing! In reality, this is a common misconception that is totally untrue. Today, the word "engineer" is far too often twisted to explain train delays and dirty construction work. In fact, the job of a toilet cleaner often comes with the title of sanitary engineer!

Engineers have had little to say about the strategies that are driving some of the most important initiatives introduced over the past decade -- those aimed at maintaining a livable world. Instead, to their credit, public policy experts, economists, lawyers and environmental group leaders have led efforts to identify solutions to myriad problems, even though science and technology are at the center of those solutions. The issues are big and worldwide, and include conserving water, conserving energy used in new buildings and pretty much anything that makes it easier for everyone to grow and prosper while better utilizing resources. Why haven't the

Engineers most able to innovate and design those solutions been part of the movement from the first days? What are the weaknesses and, eventually, the cost of developing public policies and designing action strategies for reform without the influence of those who are best able to develop innovative solutions based on technology? To a large extent, Engineers are at fault for their lack of influence. Engineers simply haven't, as individual leaders or as parts of national professional groups, stepped up and actively and publicly participated in the movements that are, correctly, calling attention to the need for reforms in how we build as well as how we conserve and better utilize resources. Engineers have ceded the leadership roles in the public forums that will advocate for new policies and seem satisfied to play a secondary role and help to carry out others' ideas. While others design the strategy for reform and determine the routes nations will take, engineers seem content to build the locomotives and put down the rails. The problem of engineers being second- and third-stage implementers rather than first-stage innovators is that there can be a cost -- either in too many dollars being spent on a solution or a solution that cannot deliver on the expectation -- when public policy is designed without adequate recognition for the technical requirements necessary for success.⁶

The word engineer is derived from the Latin word *ingeniare*. Its actual meaning is to invent or devise. Engineers are creative designers who invent, develop and manage the manufacture of their creations. These creations can be as far ranging as from computers to robots to space vehicles. Engineers are characterized by their search for how and why. Their task is continuous a quest for knowledge and their work revolves around it. Engineers are highly skilled people who invent, design and innovate. They are the people who are advancing humanity into an era of space flight and Internet information technology.

Who knows what they will do next?⁷

However, the reason that Engineers are not known to the public partially lies in the lack of involvement of civil engineers in the public policy process. Over the years, engineers have simply not recognized the direct link of the public policy process to our ethical and moral role and responsibility “to protect the health, safety and welfare of the public.” There is a misunderstanding and perception that as a non-profit organization our professional engineering societies cannot “lobby” or speak for the profession on the “Hill”. There is a misconception that Engineers and members of engineering professional engineering organizations cannot hold office or assist in political campaigns. Engineers have simply taken a back seat to politics and have chosen not to get caught up in the perceived “corrupt” and “political” process-and thus have viewed public policy as a foe.⁸ However, as Pericles observed in 430 B.C.:

“Just because you do not take an interest in politics doesn't mean politics won't take an interest in you.”

One of the key ingredients of engineering leadership is the understanding of public policy. How many Engineers realize that policies prepared by our professional engineering organizations assist legislation and the lawmakers who vote on that legislation? How many of realize that these engineering policies that are prepared by the Engineers behind the scenes are actually used by regulators in determining what happens to our infrastructure worldwide? How many Engineers recognize that it is these policies upon which codes and standards are developed and promoted for infrastructure projects all around the world? However, public policy is not just a professional engineering organization national program; it goes to

the heart of the engineering profession and requires the energies and volunteerism at all levels of government.

Two major barriers holding back Engineers in the public policy area include:

- 1) The lack of understanding of what their professional engineering organization can and cannot do; and
- 2) The uncomfortable feeling of many of the Engineers to stand up and speak out on public policy issues.

In turn, public policy has not been a priority with Engineers, resulting in little funding to tackle the one area that affects all of us as Engineers, as well as the public-the quality of life. The consequence: Engineers hold fewer leadership positions and have a reduced voice with key decision makers on critical engineering issues.

Norman R. Augustine, the Retired CEO, Lockheed Martin and former member, Presidents' Committee of Advisors on Science and Technology, noted in an Excerpt from "L. A. Engineer", *The Bridge*, in the fall 1994:

Engineers today seem to be the stealth profession, the silent occupation....If we as engineers are unwilling to responsibly speak out on issues within our realm of expertise, who then will?"

Mr. Augustine made further comments at an AIAA Summer Meeting, June 16, 1998:

The time has arrived when engineers will have to venture out from the shelter and comfort of the Ivory Tower and enter the arena of boiling controversy, real-world debate, and -- brace yourselves -- politics. It

is no longer viable to place our high-tech candle under a bushel, for at best we will find ourselves in darkness and at worst our bushel will go up in flames. ...Engineers must become as adept in dealing with societal and political forces as they are with gravitational and electromagnetic forces. We must equip engineers of the future to present their cases in almost every forum imaginable--from town meeting to state legislature, from The New York Times to Sixty Minutes, from the Congress to the Oval Office. If, as in the past, engineers place their trust solely in the primacy of logic and technical skills, they will lose the contest for the public's attention -- and in the end, both the public and the technical communities will be the losers.⁹

3. WHY POLITICS AND PUBLIC POLICY NEED ENGINEERS

In the 1920's, in the United States, the economic focus shifted away from agriculture to manufacturing. This lasted only through the end of World War II when the service industry overtook manufacturing. As the United States moved into the 1990s, the US economy again shifted to its current economic focus on information technology.¹⁰ Traditionally, the politicians had backgrounds in the fields that were most prominent in the current economic environment. Today when issues surmount in the technically-based economy, one would initially think that the Congress would be primarily comprised of technically-oriented individuals such as Engineers. However, such is not the case and the majority of decisions on technically based issues which affect the public health safety and welfare, are made by lawyers, and public administrators dominant in the political arena. This gap of required knowledge on which to make

informed decisions is detrimental to the country. If the decision makers do not have the required expertise or background, then the individuals must seek out answers from others, relying on second-hand input. Legislation based on these sources is inefficient at best and may not be in the best interest of the public.

As noted by Dr. Neal S. Lane, Special Assistant to President Clinton for Science and Technology Policy, Director of the Office of Science and Technology Policy and former Director, National Science Foundation:

Scientists and engineers constitute one of the largest, most valuable, yet least heard constituencies in America.My message to you today is that if you don't take it as one of your professional responsibilities to inform your fellow citizens about the importance of the science and technology enterprise, then that public support, critical to sustaining it, isn't going to be. ...You are needed more than ever to be visible and vocal in your communities. This requires your presence...outside the walls of your laboratories and the gates of your universities to a much greater extent than in the past.".... The ballooning of the budget deficit [in the United States] in the 1980s along with the economic drain from interest on the federal debt have energized the electorate to demand greater accountability of all government investment, including science and technology..... Engineers and scientists need to carry the message of value, application, contribution, and investment to the people whose lives are shaped by science and technology and who pay the bills for our work...We need to do this because nobody else but members of the science and

*engineering community really understands science and technology, what research is all about, how education--learning--is enriched in a research environment,...the tangible benefits of science, engineering, and technology to people's lives. I'm afraid that if we who do understand these things don't speak up, nobody will. And the American people will be the losers.*¹¹

Other United States key politicians have also spoken out on the need for Engineers in public policy. The Honorable Robert S. Walker, Consultant, former U.S. Representative and former Chair of the House Science Committee noted in the *Federation of American Societies for Experimental Biology* newsletter, Dec. 1995:¹²

Scientists [and Engineers] can positively influence the policy process by clearly and publicly enunciating the role and potential of their research so that the lay person, who may not be intimately familiar with basic research objectives, feels comfortable in knowing that his tax money is well-spent. Public seminars, school field-trips, and op-ed pieces can create widespread enthusiasm for science programs.... Furthermore, Congressional members will argue more effectively for continued research funding with their colleagues when they can persuasively defend the programs on both a budgetary and scientific basis, a task directly linked to their interactions with researchers. One of the most effective means of accomplishing this is by inviting representatives to address a gathering of researchers, or by providing hands-on tours of research facilities. Making science real for these members is the true key to legislative success.

Phillip J. Bond, Undersecretary of Commerce for Technology, U.S. Department of Commerce said in his keynote address at the Nanocommerce 2003 convention on December 9, 2003:

Scientists and engineers are in a unique position to contribute to sound policy development, address legitimate concerns, and allay irrational public fear (about nanotechnology). Scientists and engineers alone have the scientific and technical knowledge necessary to sort the wheat from the chaff.

*In addition, while not historically great communicators, scientists and engineers have unique credibility with the public in speaking to these issues. We need to communicate frequently, clearly and proactively with the public about nanotechnology to ensure Americans have all of the knowledge they need—complete and balanced—to make reasoned judgments on these issues.*¹³

Politicians struggle with an overwhelming number of decisions and need sound, practical advice. If unavailable, decisions are made too often without it.¹⁴

4. THE REASONS WHY ENGINEERS ARE IDEALLY SUITED FOR PUBLIC POLICY

Engineers by both education and personality analyze problems and find solutions in a rational, systematic way. The entire engineering mindset is to define a problem, identify alternatives, select the best solution, and then implement the most beneficial solution. Engineers are knowledgeable about an array of subjects including business, public health, and technology. They are also people just like the rest of the population. These attributes make

Engineers ideally suited for them to advocate feasible solutions to problems faced by Society. If Engineers were legislating these technological solutions, public welfare would be maximized and the negative impact of technology would be minimized.¹⁵ These opportunities will be missed if engineers continue their traditional non-involvement in politics.

The Engineer is entrusted with two key attributes that are critical to public policy and politics:

- (1) The training of critical thinking on solving problems as well as training as to the very activities required to sustain a quality of life for mankind as we know it today; and
- (2) The moral and ethical obligations that the Engineers vows as part of the Engineer's profession to protect the health safety and welfare of the public.

4.1 Engineering Definitions

There are multiple definitions that define the Engineer and Engineering. The term **civil engineer** refers to an individual who practices civil engineering. Originally the term "civil" engineer worked on public works projects and was contrasted with the military engineer, who worked on armaments and defenses. Over time, civil engineering has spun off a variety of fields e.g. architectural engineering, electrical engineering, mechanical engineering, and what is still called civil engineering.¹⁶ An interesting definition could be, "The profession of Civil Engineering is the art of directing the great sources of the power of Nature for the use and convenience of Man."

According to Webster's dictionary, the definition of an engineer is:

1. To lay out or construct, as an engineer; to

perform the work of an engineer on; as, to engineer a road. --J. Hamilton. [1913 Webster]

2. To use contrivance and effort for; to guide the course of; to manage; as, to engineer a bill through Congress. [Colloq.]¹⁷

Using Wikipedia provides yet another definition of an Engineer that notes:

An engineer is someone who practices the engineering profession.

And defines engineering as:

*...the application of science to the needs of humanity. This is accomplished through knowledge, mathematics, and practical experience applied to the design of useful objects or processes. Professional practitioners of engineering are called engineers.*¹⁸

Engineers perform services or creative work as consultation, testimony, investigation, evaluation, planning, design and design coordination of engineering works and systems, planning the use of land and water, performing engineering surveys and studies, and the review of construction or other design products for the purpose of monitoring compliance with drawings and specifications. Such work or services may be either public or private, in connection with any utilities, structures, buildings, machines, equipment, processes, work systems, projects, and industrial or consumer products; equipment of a control, communications, computer, mechanical, electrical, hydraulic, pneumatic, or thermal nature. United States laws, which vary by state, govern the licensing of professional engineers.¹⁹ Laws in other countries have similar licensing laws and regulations, including Canada, Australia and Japan.

Engineering is concerned with the design of a solution to a practical problem. A scientist may ask "why?" and proceed to research the answer to the question. By contrast, engineers want to know *how* to solve a problem, and how to implement that solution. In other words, scientists investigate phenomena, whereas engineers create solutions to problems or improve upon existing solutions.²⁰ As politicians, decisions affecting the public health safety and welfare should also ask not just "why", but "how" and what constraints may that decision impose.

The crucial and unique task of the engineer is to identify, understand, and integrate the constraints on a design in order to produce a successful result. It is usually not enough to build a technically successful product; it must also meet further requirements. Constraints may include available resources, physical or technical limitations, flexibility for future modifications and additions, and other factors, such as requirements for cost, manufacturability, and serviceability. By understanding the constraints, engineers deduce specifications for the limits within which a viable object or system may be produced and operated.²¹ These are the very constraints and considerations that are important when considering public policy.

4.2 Engineering Codes of Ethics and Moral Obligations

Engineers have many moral and ethical obligations that they sign on to whether it be when they join a particular professional engineering organization, whether it be when they obtain a professional engineer license to practice engineering, or whether they sign on via other memberships and/or affiliations, such as their employer and/or The Order of the Engineer. These obligations go to the one of the reasons why Engineers are ideally suited to

become involved in public policy and even become politicians: the obligation to protect the public health safety and welfare and the agreement not to accept any favors or bribes which could compromise decisions which in turn could affect the public health safety and welfare.

Relative to the practice of engineering, the laws of the State of Florida for Florida Professional Engineers notes that²²:

The Legislature deems it necessary in the interest of public health and safety to regulate the practice of engineering in this state.

Engineering values transcend in professional engineering organizations around the world and in all disciplines of engineering. In the Engineers of Australia Code of Ethics, the following sections highlight the obligations with respect to the public:

3. Values

In enhancing the welfare, health and safety of the community through engineering solutions, engineers remain responsive to the imperative of the community security and social justice. Engineers are pro-active in the quest for achievement.

4. National Goals for 2004-2009

To be the primary and trusted adviser to government, industry and the community in matters of engineering, innovation and technology.

To conduct our affairs efficiently, effectively and in the best interests of our members and the community.

To embrace our responsibilities to the profession, employers and the community.²³

Within the American Institution of Architects (AIA), Code of Ethics, it is noted²⁴:

"Members shall neither offer nor make any payment or gift to a public official with the intent of influencing the official's judgment in connection with an existing or prospective project...Members serving in a public capacity shall not accept payments or gifts which are intended to influence their judgment."

Other Codes of Conduct from Engineering Professional Organizations give other insights as to the obligations of the Engineer with respect to public policy. For example, the American Society of Civil Engineers (ASCE) notes in its Code of Ethics within the Fundamental Principles²⁵:

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- 1. using their knowledge and skill for the enhancement of human welfare and the environment;*
- 2. being honest and impartial and serving with fidelity the public, their employers and clients;*
- 3. striving to increase the competence and prestige of the engineering profession; and*
- 4. supporting the professional and technical societies and their disciplines.*

Within the Fundamental Canons section, two specific canons speak to the public policy aspects:

- 1. Engineers shall hold paramount the safety, health and welfare of the public and shall strive to comply with the principles of sustainable development in the performance of their professional duties.*

- 2. Engineers shall issue public statements only in an objective and truthful manner.*

Within the Guidelines to Practice under the Fundamental Canons of Ethics 1 above, four specific guidelines further demonstrate the Engineer's obligation to public policy:

a. Engineers shall recognize that the lives, safety, health and welfare of the general public are dependent upon engineering judgment, decisions, and practices incorporated into structures, machines, products, processes, and devices.

...

c. Engineers whose professional judgment is overruled under circumstances where the safety, health and welfare of the public are endangered, or the principles of sustainable development ignored, shall inform their clients or employer of the possible consequences.

...

f. Engineers should be committed to improving the environment by adherence to the principles of sustainable development so as to enhance the quality of life of the general public.

The American Association of Mechanical Engineers (ASME) requires ethical practice by each of its members and has adopted the following Code of Ethics of Engineers as referenced in the ASME Constitution, Article C2.1.1.:

The Fundamental Principles

Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

- I. Using their knowledge and skill for the enhancement of human welfare;*

II. *Being honest and impartial, and serving with fidelity the public, their employers and clients; and*

The Fundamental Canons

1. *Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.*

2. ...

3. *Engineers shall continue their professional development throughout their careers and shall provide opportunities for the professional and ethical development of those engineers under their supervision.*

4. ...

.....

7. *Engineers shall issue public statements only in an objective and truthful manner.*²⁶

The Order of the Engineer, for instance, is an organization in Canada and the United States that specifically speaks out to ethics and professionalism. The symbol is a steel ring worn on the little finger of the working hand. As noted in the “significance of the ring” discussion during the ceremony, it is noted:

*“The ring you will receive today is a symbol of the strength and continuity of our profession. The engineer's ring says to all who see it – “There is an engineer, a person with special technical knowledge, and a publicly avowed dedication to his profession and the public it serves..... the significance of the ring is to remind each of us that even minor errors are important and ethically we must do our best to protect the life, health, and safety of the public.”*²⁷

The actual obligation that an Engineer vows to accept when becoming a member of the Order of the Engineer, that includes:

“When needed, my skill and knowledge shall be given without reservation for the public good”.

4.3 The Engineer as Politician

Contrary to stereotypes, many politicians exhibit an extraordinary sense of commitment, dedication, and enthusiasm.²⁸ Because Engineers have an obligation to further the interests of mankind, the role of the politician is a perfect fit. Because of the Engineers’ ethical standards, Engineers will be held to higher standards than the stereotyped politicians and as such will be held in higher regard and will enlist more trust from the public. Engineers often have superior knowledge of current scientific issues as compared to career politicians which can be extremely useful when debating legislation regarding emission guidelines from automobiles, clean water, energy policies, and air pollution mandates. Since the Engineer is to protect the public health safety and welfare, this moral obligation, combined with the Engineer’s ability to think and devise solutions to problems, has major benefits for government positions and political positions since a person in office should also strive to create legislation, public policies, and economic budgets that are to protect the public and environment while at the same time furthering progress.²⁹ Engineers have a unique opportunity and responsibility to the public to promote issues such as energy, clean water and sustainability and other key global issues especially through political involvement.

5. IN A WORLD WHERE ENGINEERS ARE TRUE POLITIANSIAN EXAMPLE THAT IT CAN WORK

Public policy, globalization and professionalism-all key areas where Engineers ought to be in the forefront. So, If you were to have a vision of the perfect state, the perfect city where Engineers held the top government positions, where Engineers were

active in public policy, where partnerships were formed with other cities, other states, other prefectures, other regions, other countries, where designing and building could be accomplished on budget and schedule, where innovation was key and restoration was blended with the new, where private and public investment came together to better the quality of life for the population, where roads and bridges were repaired and expanded to meet the congestion needs and to reduce the commuting time, where would you be? Many would say no where because this scenario would only exist in an Engineer's dream. However, this dream is reality and believe it or not, the Engineer's city is located in the Dmitrov Region of Russia.

During a Presidential delegation of the ASCE to Russia in 2004, the ASCE delegation met with their Russian counterparts, and were taken to a town approximately 70 kilometers outside of Moscow named Dmitrov. Dmitrov is in the Dmitrov District of the Moscow Region and is one of the oldest towns in Russia. It celebrated its 850th birthday in September, 2004. The Dmitrov District consists of 2 towns, 4 settlements, and 440 villages. There are 1000 kilometers of roads.

The head of the District, equivalent to a United States State Governor is a professional civil engineer. His name is Valeri V. Gavrilov, and he has held three 5-year terms in this elected position. The Mayor of Dmitrov and his Deputy, who is responsible for the construction policy of the Region, are also civil engineers. The representative of the Moscow Region is also a civil engineer. In fact, past Russian President Yeltzin was also a civil engineer-a fact that many of Engineers probably did not know. Engineers are not only well respected in Russia, they are believed to be the most qualified to hold government positions that require the knowledge to

move Russia forward. Mr. Gavrilov's comment to the ASCE delegation was "Happy is the man who has the profession of a civil engineers, who can leave behind what he has created with his own hands and can tell his grandchildren that he built this. Happy is the man who has the profession of the civil engineer who will leave his mark on the world long past he has gone for the people to enjoy."

Gavrilov is a man of great vision-a vision to see his District expand for the betterment of the people. Upon the fall of the Soviet regime, Dmitrov was one of the first developments in the Moscow Region. It was recognized early that private investment was required to improve the conditions of the city and to become a true business. While Russia went through hard times from 1990-1998, Dmitrov suffered no losses. Industrial plants remained opened and jobs flourished. More that 4000 workers are still needed in the Region due to rapid expansion. Unemployment is only 1 percent and this percentage represents that portion of the population that just does not want to work. Young people are encouraged to stay and are provided with facilities such as sports facilities, activity clubs, and activities where the families can come together. A new sports complex is being built with another 20 to be constructed in the region. The quest to engage young people in activities has significantly reduced juvenile delinquency and drug use and created a base for the city's work force.

Bureaucracy of the Soviet era restricted how civil engineering projects would be completed. Basic needs were all that was completed with cost being the major factor and quality not considered important. Minimum facilities to meet the basic public needs were all that mattered and only within the confines of what the mother country could afford. Outside assistance was unheard of. As a result,

upon fall of the Soviet, massive reconstruction was necessary and multiple problems had to be rectified. One of the major problems of housing people in the Soviet era has become one of the biggest new problems of today. Housing was owned and controlled by the government and construction, while swift to house people, was done so at the expense of quality. 50-years later, these buildings must now be demolished with new residential multi-use developments where apartments, duplex side by side and single family homes are constructed with common facilities such as parks, libraries, sports complexes, day care centers and shopping can all be incorporated together, allowing families the ability to walk or drive and have a choice.

He noted that his plans to build an additional 70 new facilities would have never been realized under the Soviet years. Private investments and a capital market have resulted in a new middle class where most families now have cars and now make an income to allow social spending, travel and enjoying life. Gavrilov has long recognized that partnerships with companies and countries results an increased ability to expand the infrastructure and to renovate and innovate.

Innovation has been introduced in many aspects of the city's features. For example, there are fountains throughout the city that have been constructed to "entertain". The fountains go off every two hours-and not only do they flourish with water, but the water "dances" to music-both Russian and pop music from all around the world. Partnerships have been forged with cities and countries around the world for innovative technology and research. Agriculture has become a big business and new joint ventures with multiple countries have been formed to research new technologies in vegetable and potato growing. With Moscow only 70 kilometers away,

there is a market of 10.5 million people. The only farm breeding animal research station in Russia is currently being designed and will be built in Dmitrov. San Diego, a city in Southern California of the United States has become a sister city and together will design and build the country's; largest medical center with research in new medical technologies. Venture Capital money from the United States has also resulted in a new nursing home and senior center for the elderly. The facility is a modern facilities with tile and wood and spacey rooms with the comforts of television, refrigerators, large bathrooms and the common areas where the old traditions of Russia are blended with the new. Construction is of very good quality.

Roads and bridges are being repaired and brought up to new international standards. Additional roads are being constructed. Historical buildings are being restored to their original state and Soviet buildings are being demolished to make way for modern housing and new industrial facilities. Companies, including designers and construction firms were brought in from around the world with a surge of construction which started on July 1, 2004 with the goal of completion by the Jubilee. 15th Century cathedrals were restored to their original conditions with frescos restored and artifacts again displayed-all in less than 2 years. Original stone cobblestone walkways cleaned up and restored to provide walkways into the past-yet bring people to the future.

The problems faced by Dmitrov today are not unlike what the United States faces today: Maintenance, housing and common services (i.e. water, sewage and power). \$70 million Rubbles (29 rubbles/dollar) is being invested for heating, water and sewage. Housing is slowly being transferred from public ownership to private ownership as

private investment is made to provide funding for expansion projects. However, with a civil engineer at the helm-plans are underway to continue this Region's development and to make it a world class place for business and tourism alike. Public Policy, Globalization and professionalism-all in Gavrillov's vision-all in a civil engineer's dream-except this one man's dream is reality-one that Engineers around the world should strive to repeat.³⁰

6. MAKING THE TRANSITION

Engineering focuses on actions, while politics on compromise and negotiation. Can the Engineer make a successful transition into the political arena? Engineers while having a succinct laid out thought process in arriving at solutions; tend to have a different thought process than politicians to accomplish their respective goals. The Engineer's thought and decision process strives to choose one alternative by identifying an existing problem. The politicians follow a similar process, but select the most beneficial alternative with focus on justification and compromise relative to their constituents' desires. The political process places more emphasis on the stakeholders rather than from an engineering standpoint that may be the optimal solution for the specific technical problem.³¹

This is where the Engineer clearly holds the advantage. While a non-engineer may make decisions that may involve compromise, an Engineer can ensure that the welfare of the public is not compromised while at the same time assuring that the decisions for the government are made to the best interest of the nation. In addition, not only is government involvement essential to the Engineer's responsibility, it is essential to the survival of the engineering profession as a whole. Government is vital in upholding the standards of the profession and improving the integrity of the field. Government has

the power and influence to take important projects from the drawing board to reality.³² Funding is also key to critical projects that are essential for the well-being of the public. Thus, if the Engineer were to take a major role in the regulatory and legislative process, the benefits would not only be to the engineering profession, but to the public to which they serve.

If Engineers are to raise the bar on their profession then public policy must be viewed as a friend and not as a foe. Engineers need to be aware of the facts of what their professional engineering organizations can do in the public policy area as well as what you can do as an individual member. While some professional organizations are not able to endorse specific candidates for office, due to government tax status, most do and actively participate in public policy and "lobbying" relative to legislation regarding engineering issues. However, as an individual, an Engineer can run for office, participate in political campaigns and make contributions to those individuals that an Engineer believes are in the best interest of our nation and engineering issues.

The Engineering profession globally must also dispel the perception that engineers cannot participate in public policy or politics just because they are engineers. Engineers often feel it is impossible for them to participate in public policy or hold a political position, indicating "I would not have a chance since it is a political appointment" or "I do not feel comfortable in presenting or writing letters to my congressmen as I do not know enough about the issue at hand". Engineers are often respected and ridiculed for their intense beliefs and interests. Perhaps because of their deep understanding of the interconnectedness of many things, engineers such as United States Past Governor of New Hampshire

and President Bush's Past Chief of Staff (1989-1992), John H. Sununu, a mechanical engineer, are often driven into politics to "fix things" for the public good. Sununu delivered a talk at Purdue University in the United States entitled "The Engineer in the Public Policy Arena." In his address he indicated:

"People don't think of engineers as being actively involved in public policy, but I think there is a great need for people with the quantitative skills and the problem-solving understanding that engineers have to be much more visible, active and involved," Sununu said. "Public policy is getting more and more dependent on technology."..."Nobody ever expects a mechanical engineer to end up as governor or chief of staff to the president of the United States," Sununu said. "I think my background served me well in government, and I try to encourage some of the young engineers who might be listening to be a little bit more interested in taking that route. I understand there is only one real engineer in the U.S. Senate, and it happens to be my son."³³

In addition, Richard G. Weingardt, P.E., President, American Consulting Engineers Council (1995) indicated:

Engineers cannot afford to sit on the sidelines while others shape our physical environment and public policy. By virtue of our training and experience, we're well qualified to apply innovative problem-solving skills in the public arena. Getting involved in government enables us to take the lead in addressing critical quality-of-life issues facing American communities: crumbling infrastructure, environmental and economic decline, public

*transportation, hazardous waste, and crime.*³⁴

Even if an Engineer chooses not to run for political office, one of the key activities that Engineers can do is to communicate with their respective lawmakers in their respective countries, no matter whether the Engineer wishes to personally become active in the political arena. Professional organizations such as IEEE have developed guidelines to assist Engineers in how to communicate with their respective lawmaker³⁵:

- *Identify clearly the issue in which you are interested. Be sure to include the House or Senate bill number if addressing specific legislative proposals.*
- *State briefly why you're concerned about the issue. Your personal experience will lend supporting evidence. Explain how you think the issue will affect your business, profession, community, or family.*
- *Explain how your issue or concern affects the Congressman's constituents and how you think those constituents will benefit from your position.*
- *If you want your Congressman to take action on your behalf, clearly (but politely) ask for this action. Don't expect Members of Congress to know exactly how to solve the problem, and don't expect them to read between the lines to discern what you want done.*
- *If you have an idea you'd like to see turned into legislation, suggest this initiative to your Congressman. Volunteer your services as an information resource or researcher on the subject.*
- *If your issue has been discussed in newspapers or magazines, be sure to include copies with your correspondence. If the issue hasn't been included in the news media, it might be useful to attract the interest of the press first.*

- *Restrict yourself to one topic in a letter or other communication. Concentrate your arguments; summarize them and make your recommendations on one page.*
- *Use your own words and avoid technical terms. Also avoid using trite phrases or clichés, which can make your correspondence sound mass-produced. When Members of Congress receive many letters with nearly identical wording, they may discount them as being part of an organized pressure campaign. This method works only when mail is so voluminous that it has to be weighed. Personalized, individual letters often work best.*
- *Communicate at any time, but especially when legislation is being considered by Congressional committees or subcommittees, before it reaches the House or Senate floor. Your communication will mean more when attention is currently focused on the subject matter of your concern.*
- *Find out the committees and subcommittees on which your Congressman or Senators serve. They have more influence over legislation in these jurisdictions.*
- *Present the best arguments in favor of your position and ask for their consideration. You may find it useful to review arguments against your position and show why your position is preferred over others.*
- *Communicate with Members of Congress as a constituent, not as a self-appointed neighborhood, community, or industry spokesperson. However, if you are truly representing a particular group, mention it.*
- *If Senators or Representatives have supported your cause or idea in previous legislation, let them know you appreciate their past leadership on the issue and that such support is applauded by their constituents.*

In addition to Engineers being involved, either as

politicians or aiding politicians with information vital to making decisions that affect the public health, safety and welfare; engineering education has to revise its curriculum to highlight the importance of public policy within the engineering profession. Engineering education has moved to a purely technical viewpoint versus concentrating on the very elements that are also essential to providing the Engineer the necessary tools required to become leaders-both in business and in politics. Engineering education needs to include courses that include discussions on how politics influence the engineering profession. Professors need to integrate contemporary problems, global issues and world politicians into the technical curriculum. This will ensure at a basic level that engineering graduates have a basic grasp of public policy issues and that politics is an acceptable career choice for Engineers. Political involvement will allow Engineers to directly enhance the public welfare, the environment and the society through their specialized knowledge and skills.

7. CONCLUSION

Policymakers and the public benefit from an understanding and appreciation for the value of the engineer. Thus, engineers have an obligation to participate in public policy and public awareness. To maximize engineers' effectiveness in public policy and public awareness, engineering societies should work together and leverage their resource through close association. The engineering societies globally, on behalf of their members, should be the advocates of the engineering profession's common viewpoints on issues important to their respective nation and the profession. The engineering societies can contribute effectively in shaping public policy and public awareness by providing a forum for team building and liaison, sharing information through collection, analyzing, and disseminating, and coming to a

consensus on issues. When taking action the engineering organizations should speak with a unified voice and cooperate in their respective activities and with their resources.³⁶

Life will continue without engineering leadership if we let it. However, the results from the current process will most likely not be desirable for Engineers or for the public. Key engineering leadership positions will continue to be filled by other professionals, despite their lack of understanding of the engineering issues. If Engineers turn their backs to the public policy process, Engineers stand to put their own profession in jeopardy. As is true with most areas in our lives that require change, change can only come about from those who are willing to stand up and be heard. Engineers must take a more active role in the legislative process to ensure that legislation is enacted that is truly in the interest of protecting the public health safety and welfare.

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