ACCELERATING THE NUCLEAR RENAISSANCE: CRUCIAL ROLES FOR GOVERNMENT AND INDUSTRY

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Ten years ago, the phrase "nuclear renaissance" conveyed only a cautious hope within a narrow community of dedicated professionals. Today, the rebirth of nuclear energy has become an unmistakable reality that is gathering speed and momentum on the full world stage.

This revitalisation is a composite of several developments:

- Continuing evolutionary advance in reactor technology
- Multinational research efforts to produce quantum leaps in technology
- Unprecedented levels of efficiency and capacity utilisation in key countries
- A robust and accumulating record of operational safety, backed by the emergence of a global nuclear safety culture
- Political progress in implementing the scientifically sound concept of waste disposal using deep geological repositories
- And the truest barometer – expansive growth planning for nuclear power in major nations in both the developed and developing worlds.

In countries representing the preponderance of world economic activity and world population – from North America across much of Europe to Russia and on to the leading countries of South and East Asia – the value of nuclear power has been reviewed and reaffirmed. Major countries without nuclear power – such as Poland, Turkey, and Vietnam – stand on the threshold of introducing nuclear energy for the first time; and even Italy, the one nation ever to suspend nuclear generation, now plans to reconsider.

To be sure, anti-nuclear convictions can still be found:

- In the mythologies that motivate many environmental groups
- In the assumptions of environmental journalists and bureaucrats
- In the rhetoric of some small countries like Denmark and Austria that are not inhibited by the hypocrisy of importing nuclear electricity, and
- In the case of Germany, in the declaratory policy of a major country where a governing coalition is temporarily beholden to a small minority party.

But all of these reactionary forces, taken together, are receding under the onslaught of facts that are too strong to be forever distorted or denied. All around the world, old-school anti-nuclear environmentalism is being eclipsed by a new realism that recognises nuclear energy's essential virtue: its capacity to deliver cleanly generated power safely, reliably, and on a massive scale.

The True Environmental Problem: Nuclear Growth is Too Slow

For the nuclear industry – from uranium miners to technology vendors to plant constructors – this expansive outlook offers a promising future. But for serious environmentalists, current projections can provide little comfort – not because nuclear energy is growing but because it is not yet growing fast enough to play its needed role in the clean-energy revolution our world so desperately needs.

The urgent imperative of a global clean-energy revolution is now evident to any literate person who is not in a state of psychological or political denial.

Today, fossil fuel combustion is pouring carbon dioxide into the atmosphere at the rate of 25 billion tonnes a year – or 800 tonnes a second – and this rate has not yet been slowed by either rhetoric or negotiation.

Our best climate experts tell us that we are now heading rapidly toward a point of irreversible, catastrophic climate change that could bring:

- Rising global sea levels eventually reaching 40 feet
- An end to the Gulf Steam and its benign warming effect on North America and Europe
- An accelerating loss of biodiversity throughout the world
- Widespread drought and extreme weather turbulence
- A global epidemic of pestilence and disease, and
- In consequence, a fundamental disruption of human civilisation.

These warnings come not from fear-mongers but from scientists, who have judged that our only hope of averting this calamity is to shrink worldwide greenhouse emissions by 50-60% over the next 50 years. And we must accomplish this amidst an enormous surge in human population and economic development that will triple world energy consumption.

If history is a river, we have reached the white water. We face a challenge unprecedented in human experience. Meeting it will require every ounce of political will and human ingenuity we can muster through the combined forces of industry and government.

Our starting point for action must be agreement on a basic premise that emerges from every authoritative analysis:

> *Humankind cannot conceivably achieve a global clean-energy revolution without a huge expansion of nuclear power – to generate electricity, to produce hydrogen for tomorrow's vehicles, and to desalinate seawater in response to the world's rapidly emerging fresh-water crisis.*

We must ask two crucial questions:

- First, where do industry and government stand in meeting legitimate public concerns about nuclear energy?

- Second, what must now be done to accelerate the nuclear renaissance?

Meeting Legitimate Public Concerns

As to the "public concerns" so often cited in daily journalism, a fair assessment shows that not one poses a reasonable obstacle to a global expansion of nuclear power.

1) Proliferation. Nuclear proliferation, of course, remains a global concern, and much can be said about how best to deal with the few rogue nations that may seek atomic weapons by constructing facilities that can produce weapons-usable material. The industry stands ready to work with the IAEA and national governments in exploring ways to curtail this risk.

But the essential truths are these:

- The proliferation danger inheres in nuclear knowledge and the intent of governments

- The global non-proliferation and safeguards system – one of the greatest achievements in diplomatic history – effectively curtails any link between civil and military programmes, and actually helps to detect and deter illicit nuclear activity, and

- Most fundamentally, whatever proliferation risk we face would be unaffected even by a 20-fold increase in the global use of safeguarded nuclear reactors to produce clean energy.

2) Operational Safety. Second, the industry has met the challenge of operational safety through technological advance and a global nuclear safety culture that draws on some 12,000 reactor-years of practical experience.

If the NPT is a great feat in traditional diplomacy, the creation of WANO – with its network of safety cooperation encompassing every power reactor worldwide – represents an historic attainment in *private-sector* diplomacy.

The nuclear industry's greatest responsibility is to maintain and build on its already impressive record of nuclear safety.

3) Cost Reduction. On the cost front, the industry's steady reductions in both operational and capital costs are fast carrying us into a future in which nuclear power will emerge as a clear winner on the field of affordability.

These gains are occurring even without any consideration of environmental effects. Once governments begin to introduce serious emissions penalties – through emissions trading or carbon taxes – the balance will tilt even faster. Today nuclear power can easily dominate any market that imposes a real price for environmental damage.

4) Waste Management. As to waste, industry and government have the joint task of building public recognition that, contrary to common perception, waste is nuclear power's greatest comparative asset – precisely because the volume is minimal and can be safely managed without harm to people or the environment.

For its part, the industry has amassed an impressive record that includes:

- Safe disposal of all low-level waste
- Safe interim storage of all other end products from nearly a half century of nuclear power plant operations
- Safe transport of radioactive waste, with more than 20,000 containers of high-level waste and used fuel having travelled safely over a total distance of 20 million miles without a single instance of a serious radioactive release.

Where major responsibility lies now is with governments. A strong scientific consensus favours deep geological repositories as a safe and affordable means of achieving long-term storage of nuclear waste and used nuclear fuel. It is the duty of governments – following the lead of Finland, Sweden, and the USA – to summon the political will to implement this crucial component of the nuclear fuel cycle.

Accelerating the Nuclear Renaissance

Meeting legitimate public concerns about nuclear energy is clearly necessary – but not nearly sufficient to drive a nuclear renaissance that must attain global dynamism if we are to achieve a clean-energy revolution.

In three distinct areas, governments must take decisive action to grow an industry that now stands – in terms of operational and technological maturity – fully primed for the major growth our environmental challenge so clearly demands.

1) Construct a Comprehensive Global Regime. The first necessity is to move beyond Kyoto to construct a truly comprehensive, long-term climate regime that yields strong political signals – and economic incentives – for a worldwide transformation to clean-energy technology.

To be both effective and politically feasible, any such treaty must include all major nations, developed and developing, and must embody some variation on the principle of "contraction and convergence".

"Contraction" means that the agreement must produce, over a span of decades, a global reduction in greenhouse emissions on the order of 60%. "Convergence" means that the agreement must adopt the principle of equal per-capita emission rights.

The principle of equal emission rights is far from utopian:

- First, as a matter of political reality, it is the only feasible principle for a global agreement, and actually involves a concession from South to North by taking as "water under the bridge" the considerable environmental damage already done by the developed countries.
- Second, the gap between actual emissions and emissions rights provides the potential for a dynamic international trading mechanism that will promote universal efficiency in clean-energy investment while producing a large net flow of such investment from North to South.

From a Northern perspective, this economic assistance will be the most cost-effective in history if it helps to prevent the globally destructive growth in greenhouse emissions that might otherwise occur in the developing world.

For years, economists have developed models of "win-win" welfare maximisation among parties with very different characteristics. A global climate change regime must now apply this body of learning to produce collective action aimed at the most dangerous security challenge ever faced by humankind.

2) Elevate Nuclear Investment to a National and International Policy Priority. The second necessity is to shape national policies and international institutions to directly support nuclear investment.

Over the long-term, nuclear power is competitive. But two factors now weigh against nuclear investment: the short-term bias of deregulated energy markets and the fact that 21st century nuclear reactors have not been built in sufficient numbers to achieve economies of scale.

As a step toward energy independence and as an urgent environmental imperative, it is essential that national governments take the steps necessary to incentivize immediate nuclear investments. This pump-priming can be achieved by a temporary production subsidy, by absorbing some first-of-a-kind-engineering costs, or just by redistributing these costs from pioneers to those who follow.

Among the tools to be used are loan guarantees, accelerated depreciation, and production and investment tax credits. For the last decade, such tools have been widely used to subsidise politically correct renewables. It is now time to apply the same tools to a technology that can deliver clean energy on a massive scale.

The goal, it bears emphasis, is not to subsidise long-term nuclear operations but simply to accelerate the nuclear renaissance for reasons of national interest and the global environment.

A similar rationale applies, at the international level, among the global institutions we established a half-century ago to meet urgent developmental needs. Today it is a fundamental failing of the UN system that, at this crucial juncture, all of its major development institutions continue to embrace, or to be intimidated by, old-school anti-nuclear environmentalism. The IAEA stands isolated and alone in working to promote the peaceful uses of nuclear energy. While an unprecedented global crisis intensifies, others fiddle in a safe cocoon of political correctness.

Governments must now direct the World Bank and the UN Development and Environment Programmes to act in pursuit of a clean-energy vision in which nuclear power holds a central role.

3) Preparing the Nuclear Profession for a Nuclear Century. A third imperative on which governments must act is to apply the concept of nuclear investment to the human level – by actively stimulating and supporting enrolments in the study of nuclear science and technology. The nuclear profession must be readied for a nuclear century.

There is today an enormous disparity between the fact of the unfolding nuclear renaissance and the pace at which we are educating a new generation of nuclear scientists and engineers. In many nations, the decisions of students choosing career paths are not yet being informed by recognition of the value of nuclear energy and the inevitability of its sharply expanding use worldwide.

Eventually, market forces will rectify this disparity between the demand and supply for skilled nuclear personnel. But a failure to be pro-active in stimulating nuclear education will make the correction inefficient and thereby delay the nuclear renaissance.

To help point the way toward a globalising nuclear profession, the World Nuclear Association has worked with the IAEA, WANO, and the NEA to create the new World Nuclear University. The aims of this worldwide partnership of leading institutions of nuclear learning are:

- To enhance nuclear coursework at participating institutions worldwide
- To establish widely accepted global standards in academic and professional qualification, and
- To elevate the prestige of the nuclear profession.

To support this institutional cooperation, what is urgently needed is a major global infusion of scholarship funds for study in nuclear science and technology. Governments around the world should marshal their own resources – and summon the support of the great philanthropies – if we are to build the professional global cadre that can apply nuclear technology successfully to meet a desperate world need.

At a Perilous Point in History, a Technology and a Profession of Indispensable Value

Today technology is spurring a growth in world population and energy consumption that jeopardizes the very future of our biosphere. But the technological ingenuity that is propelling a world crisis can also be our salvation – if we use it wisely.

The global nuclear industry today is the repository of a technology that will be indispensable if humanity is to preserve the very environment that enabled civilisation to evolve. Governments must now emerge from postures of timidity and equivocation to act decisively in support of that industry.

Our world is in dire peril, and we have no time to lose.