

Technological and Institutional Innovation to maximize Nuclear Energy's Contribution to Sustainable Development

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ABSTRACT

Innovation is necessary in the area of Nuclear Energy (NE), ultimately, to maximize the benefit from the use of Nuclear Energy. Evaluation of specific Innovative Nuclear Energy System (INES) using the methodology developed by INPRO would help to confirm “satisfaction of the sustainability goal at an elevated level. “Sea of ideas/Findings/Research Results” needs “exploitation” to be entitled as “innovation”. Institutional innovation has very high priority in nuclear energy area.

1. Introduction: NE in the context of Sustainable Development

Why innovation is necessary?

Maybe the answer will be to meet the new demand, to stay competitive with other options, and in the area of Nuclear Energy (NE), ultimately, to maximize the benefit from the use of Nuclear Energy. Sustainable Development is defined as “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs”[1] and is based on recognition that achieving global equity and sustainable growth would require technological and social changes”.

Energy indicator for Sustainable Development [2] was developed by the international organs to analyze past trends and current situation, to measure distance to target and to formulate strategy by exploring options.

This energy indicator set includes various dimensions: equity (affordability, accessibility etc), .safety (health effect etc), economy (reserve/production, security of supply etc) and environment (climate change, air quality, land use etc).

Details regarding how NE has a high potential in each of these indicators is discussed in a separate paper by the author. [3] Further, evaluation of specific Innovative Nuclear Energy System (INES) using the methodology developed by INPRO would help to confirm “satisfaction of the sustainability goal at an elevated level”. [4]

2. Technological innovation

According to the classic innovation theory, for a certain specific technology field, development is made through integration of sigmoid curves in a way growth is made by starting a new sigmoid curve before existing one peters out. [5]

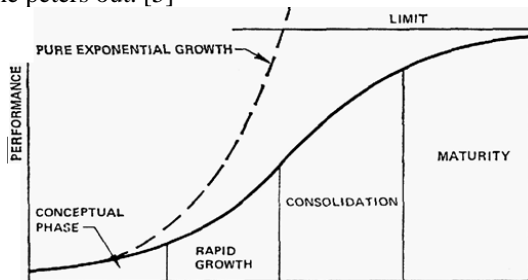


Fig-1.Sigmoid curve [5]

Such simplistic characterization may not apply to nuclear technology, because the market is considerably different from ordinary commodity and there are complex dimensions such as Non-proliferation, Size of necessary technological infrastructure for innovation, Risk and Conservatism.

Societal expectation plays an important role in shaping this curve, whereas expectation is not necessarily high enough and there many societal constraints in the development/implementation process. This leads to the discussion of the *issue of institutional innovation*.

3. Institutional innovation

“Sea of ideas/Findings/Research Results” needs “exploitation” to have social value and entitled as “innovation”. In reality, social & institutional conditions very often bar “exploitation” of new technologies to satisfy Sustainability goal at an elevated level. There are examples where we need institutional innovation or adaptive change to maximize the benefits from the use of NE such as non-proliferation, disarmament and MNA, stakeholder involvement in informed decision-making, level playing field considering non-market values, sovereign rights of licensing and international safety concern, gaps among individual country’s practices, political tenure versus time for nuclear R&D.

4. Concluding remarks

Quantitative analysis using EISD to explore options using INPRO methodology in 7 areas will benefit to clarify the contribution of specific INES. “Sea of ideas/Findings/Research Results” needs “exploitation” to be entitled as “innovation”. Institutional innovation has very high priority in nuclear energy area.

5. References

- [1] “Our Common Future”, 1987
- [2] “Energy Indicators for Sustainable Development”, IAEA, 2006
- [3] A. Omoto, “Nuclear Energy and Sustainable Development”, XI CBE conference, 2006
- [4] IAEA-TECDOC-1575 Rev1, “Guidance for the Application of an Assessment Methodology for Innovative Nuclear Energy System”, November 2008
- [5] Starr et al, “Parameters of Technological Growth”, Science 182 (October, 1973)