Enabling a fossil free power supply through Generation 4 nuclear technology

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We have an opportunity

Technology has matured to a level that allows us to establish a sustainable and climate neutral power supply system for the global population.



Content

- The facts
- The alternatives
- The role of nuclear technology
- The role of Sweden and Swedish industry



Fact 1: The global population



WORLD: Total Population



1971-2009 increase by a factor of 1,8

World Population Prospects: The 2015 Revision. http://esa.un.org/unpd/wpp/

Fact 2. The global energy consumption



In 2012 – 42 % of the primary energy is converted to electricity



Source: International Energy Agency

Fact 3. The global electricity consumption



* IEA estimate.

World Energy Outlook

Source: IEA databases and analysis.



1971-2009 increase by a factor of 3.8

The alternatives



Vätgasbilstankning Foto Shizuo Kambayashi

The alternatives



Vattenfall LCA Study (July 2012)



The alternatives Source: Statens offentliga utredningar. Swedish smartgrid. Delårsrapport 2013 1 E Stamnät - 230-400 kV Regionnät - 100-230 kV -----Distributionanát - 10 kV Lokalnät - 400/230 European high voltage transmission grid Voltage Category 220kV - 299 300kV - 499 500kV - 999

Renewable power production sources pushes interoperability





Source Qvist, Uppsala University, 2016

The role of nuclear technology

Electricity production by technology in the 6DS and the 2DS



Vestinghouse

The market for nuclear new build



The 2015-2040 market for new build nuclear is 366 GWe, including replacement of 148 GWe of retirements

The nuclear time line



Source: NEA IEA 2015 Technology Roadmap, Nuclear Energy

Will nuclear be sustainable?



* Includes all existing, committed, planned and prospective production centres supported by RAR and inferred resources recoverable at a cost of <USD 130/kgU.

The future is tomorrow

Generation IV will:

- Significantly reduce radioactive decay half-life
- Result in several factors larger fuel usage
- Allow a closed fuel cycle resulting in essentially infinite energy supply
- Enable large scale hydrogen production





Generation IV enables a global fossil free power generation and transportation system

2030



Westinghouse accelerates LFR technology

Westinghouse selected LFR because of the safety performance combined with best economic potential and technology readiness level

Economic Potential

Compact Nuclear Island High power density core High plant efficiency Design simplicity Modular construction

Enhanced Safety

Chemically-inert coolant High boiling point coolant Atmospheric pressure No pressure-driven LOCA Strong reactivity feedback Enhanced defense in depth barriers

Global Marketability

All plant sizes: microreactor, SMR, GWe-size Energy storage capability for variable electricity output Non-electric applications Potential for long-life core Potential to close fuel cycle



The role of Sweden and Swedish industry



The role of Sweden and Swedish industry

What does it take?

- A recognition of the market potential for Swedish industry
- Funding sources must support Swedish nuclear academia
- A recognition that Sweden can do a difference in the development towards a sustainable fossil free power supply and transportation system by leveraging its nuclear competence
- We need to look at the global situation. This is not a choice between hydro/wind/solar/nuclear in Sweden
- A recognition that it is not a closed national electricity market.
 We do not support global climate goals by closing down Swedish NPPs



Westinghouse AP1000

Westinghouse SMR



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