

A Few Thoughts on Funding R&D

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We have a very serious problem of under investment

Given the critical changes that lie ahead for the electricity industry new technologies are urgently needed.

If basic technical knowledge already exists, then market forces can often produce commercial solutions as the need arises, although the process of moving from laboratory knowledge to commercially viable technology is long and often difficult.

Markets are notoriously bad at investing in basic technology research to support future generations of commercial technologies.

Pacific Northwest National Laboratory...

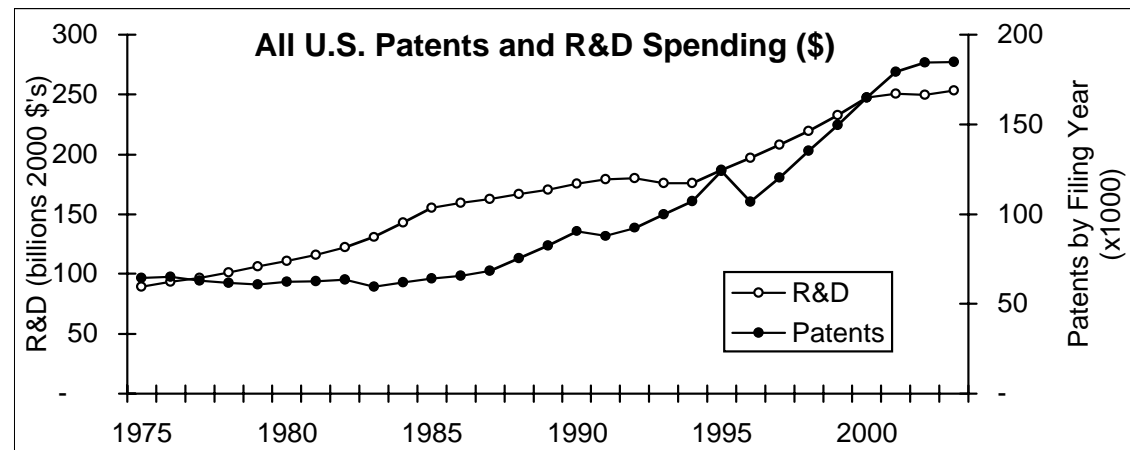
...has performed cross-national studies of energy R&D, looking at both corporate and public investment. They write:

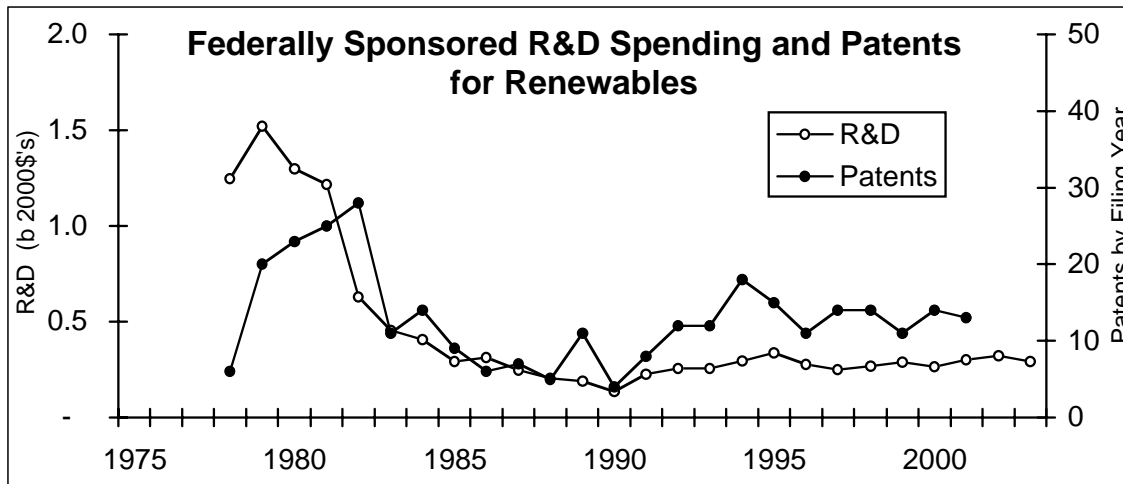
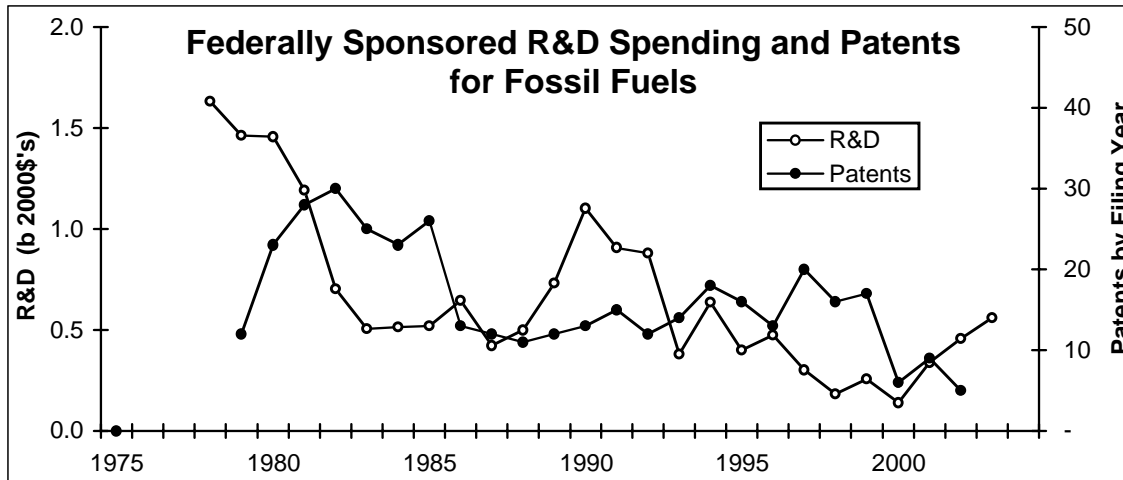
“A small group of advanced industrialized countries has been responsible for about 95% of the world’s energy R&D investments. The energy R&D enterprises of these countries embody, to a large extent, the capability for future technological changes in the world’s energy systems. Recently, each of these countries reduced its public and private sector investments in energy R&D – in some cases by more than 70%. Given fewer resources, firms and governments find themselves compelled increasingly to make difficult tradeoffs between technology areas and between long- and short-term research projects.”

In the US...

...Federal and state investments are low and often are directed at short-term or applied projects – and likely will remain so in the near future. This is especially critical as analysis shows that U.S. patenting activity, one commonly used measure of innovation, follows but lags research investments.

Nemet and Kammen have recently assembled data over time on U.S. research and patenting activity:





Figures courtesy of Gregory Nemet and Daniel M. Kammen of the Energy and Resources Group, UC Berkeley.

Support in T&D research has been on-again off-again and always modest.

EPRI Funding has shrunk dramatically...

...largely as a result of restructuring, and the resulting shorter-term and more applied focus of the industry.

At its peak ~ 575 \$/yr



Today ~ 280 \$/yr

Spillover

While the deregulated telecommunication industry invests much more in research than the power industry, it has also benefited from substantial “spill over” from basic technology research originally undertaken for national defense or other purposes.

There have been many fewer spillovers in the power industry.

Putting all these pieces together, the result is that current investments in basic technology research related to electric power are far too modest. Absent policy intervention, they are likely to remain so.

The need

The nation must develop and maintain a much expanded long-term program of power system basic technology research and a program of development and test of systems that are nearly ready for commercial adoption.

Without these programs, the USA will face great difficulties in meeting the challenges facing the electricity industry.

Academic, political, regulatory and industry leaders should work together to find a way to prioritize and fund the needed research.

A proposal

Depending on the federal government to fund and manage most R&D for the electricity industry ignores the pressures for tax and spending reductions.

Other industries pay for their own R&D. Since R&D promises major benefits for the electricity industry, the current level of funding is short sighted.

A federal mandate is needed to get companies to impose a fee that would be used to fund R&D. The U.S. spends 2.2% of GDP on research averaged over all fields. The power industry should be required to make an investment equal to 1% of total electricity industry sales.

The rule should be: spend it yourself, or hand it to the DoE.

Here's what 1% could do:

Development of IGCC and other advanced coal conversion systems	800	Basic technology research on wide band-gap semi-conductors, advanced power electronics and FACTS	80
Research on ameliorating the environmental impacts of coal extraction	30	Basic technology research on superconducting materials	30
Methods to evaluate and monitor sites for deep geological storage	300	Research on energy storage systems	70
3P emissions control technology	30	Development and demonstration of advanced methods for grid surveillance and control.	50
Basic technology research on photovoltaic materials	60	Development and demonstration of advanced energy efficient end use devices	50
Other solar related research	30	Development and demonstration of advanced methods for real time load management	30
Advanced wind technology	50	Development and demonstration of advanced distribution system controls	20
Studies of the potential weather/climate impacts of wind	5	Development and demonstration of micro-grid control technologies	10
Research on advanced nuclear power and spent fuel management options	500	Development and demonstration of CHP DG technologies	20
Research on low cost LNG	80	Fusion	60
Research on H2 handling and storage	20	Other geophysical energy sources besides wind and solar	10
Basic technology research on fuel cells	40	Other environmental issues	20
Advanced electric vehicle propulsion systems	100		
Research on portable micro-fuel cells	5		
		Total:	2500