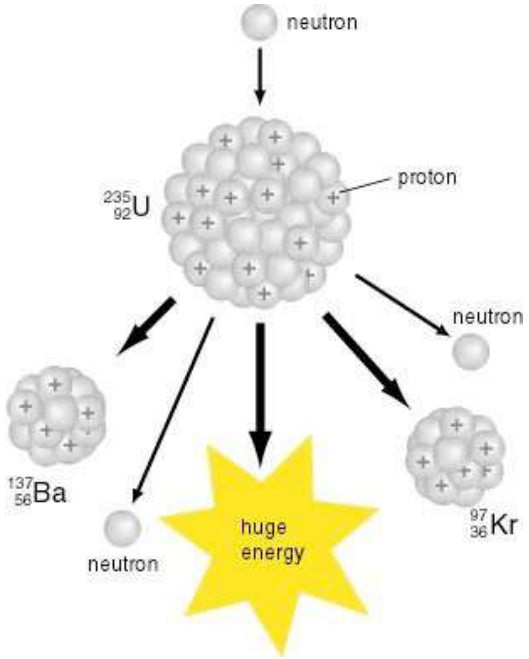


Fission is the new Fire

Rod Adams

16 April 2007

AAE

Atomic

Fire versus Fission

- Original human controlled heat
- Natural phenomenon
- 100,000+ year old technology learning curve
- Dangerous byproducts released to environment
- Still causes numerous deaths
- Basis for the world's largest industry
- Major fuel sources limited

- New human controlled heat source
- Natural phenomenon
- 60 year old learning curve
- Dangerous byproducts contained at source
- No documented injuries from commercial power by-products
- Few known deaths
- Competes with world's largest industry
- Major fuel sources barely touched

A pound of uranium

Contains as much energy as

Thirty tanker trucks full of oil

Fission is the new Fire

CP-1 Team

Atomic ZEV (Zero Emission Vessel)

USS Von Steuben SSBN632

Atomic Ambassador Ship

NS Savannah Circa 1965

Distributed Atomic Power

PM-3A at McMurdo Station, Antarctica

Small Atomic Power

Atomic fission on a 400 ton research submarine

Fission is the new Fire

Large coastal atomic power station

Diablo Canyon, San Luis Obispo, CA

Spring wildflowers at the Diablo Canyon nuclear power plant

US Electricity - All Sectors

Total

Nuclear

1960

1991

2005

609

612

780

Table 8.2a Electricity Net Generation: Total (All Sectors), Selected Years, 1949-2005

(Sum of Tables 8.2b and 8.2d; Billion Kilowatthours)

Year	Fossil Fuels: Coal [1]	Petroleum [2]	Natural Gas [3]	Other Gases [4]	Total	Nuclear Electric Power	Hydroelectric Pumped Storage [5]	Conventional Hydroelectric Power	Biomass: Wood [6]	Total	Other [9]	Total
1949	135.5	28.5	37.0	NA	201.0	0.0	(10)	0.4	NA	95.2	NA	296.1
1950	154.5	33.7	44.6	NA	232.8	0.0	(10)	0.4	NA	101.3	NA	334.1
1955	301.4	37.1	95.3	NA	432.8	0.0	(10)	0.3	NA	116.5	NA	550.3
1960	403.1	48.0	158.0	NA	609.0	0.5	(10)	0.1	NA	149.8	NA	759.2
1965	570.9	64.8	221.6	NA	857.3	3.7	(10)	0.3	NA	197.4	NA	1,058.4
1970	704.4	184.2	372.9	NA	1,261.4	21.8	(10)	0.1	0.2	251.8	NA	1,535.1
1971	713.1	220.2	374.0	NA	1,307.4	38.1	(10)	0.1	0.2	270.4	NA	1,615.9
1972	771.1	274.3	375.7	NA	1,421.2	54.1	(10)	275.9	0.1	0.2	1.5	NA	277.7	NA	1,753.0
1973	847.7	314.3	340.9	NA	1,502.9	83.5	(10)	275.4	0.1	0.2	2.0	NA	277.7	NA	1,864.1
1974	828.4	300.9	320.1	NA	1,449.4	114.0	(10)	304.2	0.1	0.2	2.5	NA	306.9	NA	1,870.3
1975	852.8	289.1	299.8	NA	1,441.7	172.5	(10)	303.2	(s)	0.2	3.2	NA	306.6	NA	1,920.8
1976	944.4	320.0	294.6	NA	1,559.0	191.1	(10)	286.9	0.1	0.2	3.6	NA	290.8	NA	2,040.9
1977	985.2	356.2	305.5	NA	1,646.9	250.9	(10)	223.6	0.3	0.2	3.6	NA	227.7	NA	2,127.4
1978	975.7	365.1	305.4	NA	1,646.2	276.4	(10)	283.5	0.2	0.1	3.0	NA	286.8	NA	2,209.4
1979	1,075.0	303.5	329.5	NA	1,708.0	255.2	(10)	283.1	0.3	0.2	3.9	NA	287.5	NA	2,250.7
1980	1,161.6	246.0	346.2	NA	1,753.8	251.1	(10)	279.2	0.3	0.2	5.1	NA	284.7	NA	2,289.6
1981	1,203.2	206.4	345.8	NA	1,755.4	272.7	(10)	263.8	0.2	0.1	5.7	NA	269.9	NA	2,296.0
1982	1,192.0	146.8	305.3	NA	1,644.1	282.8	(10)	312.4	0.2	0.1	4.8	NA	317.5	NA	2,244.4
1983	1,259.4	144.5	274.1	NA	1,678.0	293.7	(10)	335.3	0.2	0.2	6.1	NA	341.7	NA	2,313.4
1984	1,341.7	119.8	297.4	NA	1,758.9	327.6	(10)	324.3	0.5	0.4	7.7	(s)	(s)	332.9	NA	2,419.5
1985	1,402.1	100.2	291.9	NA	1,794.3	383.7	(10)	284.3	0.7	0.6	9.3	(s)	(s)	295.0	NA	2,473.0
1986	1,385.8	136.6	248.5	NA	1,770.9	414.0	(10)	294.0	0.5	0.7	10.3	(s)	(s)	305.5	NA	2,490.5
1987	1,463.8	118.5	272.6	NA	1,854.9	455.3	(10)	263.8	0.8	0.7	10.8	(s)	(s)	265.1	NA	2,575.3
1988	1,540.7	148.9	252.8	NA	1,942.4	527.0	(10)	269.2	0.9	0.7	10.3	(s)	(s)	238.1	NA	2,707.4
1989 [11]	1,583.8	164.5	352.6	7.9	2,108.8	529.4	(10)	277.2	9.2	14.6	0.3	2.1	325.3	3.8	2,967.3
1990	1,594.0	126.6	372.8	10.4	2,103.8	576.9	-3.5	232.5	19.3	15.4	0.4	2.9	357.2	3.8	3,036.0
1991	1,590.8	119.8	381.6	11.3	2,103.3	612.6	-4.5	233.7	15.7	16.0	0.5	3.0	357.8	4.7	3,073.8
1992	1,621.2	100.2	404.1	13.3	2,138.7	618.8	-4.2	266.5	17.8	16.1	0.4	2.9	326.9	3.7	3,083.9
1993	1,690.1	112.8	414.9	13.0	2,230.7	610.3	-4.0	277.6	18.3	16.8	0.5	3.0	356.7	3.5	3,197.2
1994	1,690.7	105.9	460.2	13.3	2,270.1	640.4	-3.4	287.9	19.1	15.5	0.5	3.4	336.7	3.7	3,247.5
1995	1,709.4	74.6	496.1	13.9	2,293.9	673.4	-2.7	310.8	36.5	20.4	13.4	0.5	3.2	384.8	4.1	3,353.5
1996	1,795.2	81.4	455.1	14.4	2,346.0	674.7	-3.1	347.2	36.8	20.9	14.3	0.5	3.2	423.0	3.6	3,444.2
1997	1,845.0	92.6	479.4	13.4	2,430.3	628.6	-4.0	356.5	36.9	21.7	14.7	0.5	3.3	433.6	3.6	3,492.2
1998	1,873.5	128.8	531.3	13.5	2,547.1	673.7	-4.5	323.3	36.3	22.4	14.8	0.5	3.0	400.4	3.6	3,620.3
1999	1,881.1	118.1	556.4	14.1	2,569.7	728.3	-6.1	319.5	37.0	22.6	14.8	0.5	4.5	399.0	4.0	3,694.8
2000	1,966.3	111.2	601.0	14.0	2,692.5	753.9	-5.5	275.6	37.6	23.1	14.1	0.5	5.6	356.5	4.8	3,802.1
2001	1,904.0	124.9	639.1	9.0	2,677.0	768.8	-8.8	217.0	35.2	21.8	13.7	0.5	6.7	294.9	4.7	3,736.6
2002	1,933.1	94.6	691.0	11.5	2,730.2	780.1	-8.7	216.7	36.7	22.9	14.5	0.6	10.4	351.3	5.7	3,856.5
2003	1,973.7	119.4	649.9	15.6	2,758.6	763.7	-8.5	237.5	37.5	23.7	14.4	0.5	11.2	363.2	6.1	3,883.2
2004	1,978.6	[R]120.6	[R]709.0	[R]16.8	[R]2,825.0	788.5	[R]-8.5	257.6	37.6	[R]23.3	[R]14.8	0.6	[R]14.1	358.8	[R]6.7	[R]3,970.6
2005 [P]	2,014.2	121.9	751.5	15.6	2,903.3	780.5	-8.6	267.8	24.0	15.1	0.5	14.6	357.2	3.7	4,036.0

[1] Anthracite, bituminous coal, subbituminous coal, lignite, waste coal, and coal synfuel.
[2] Distillate fuel oil, residual fuel oil, petroleum coke, jet fuel, kerosene, other petroleum, and waste oil.
[3] Natural gas, plus a small amount of supplemental gaseous fuels that cannot be identified separately.
[4] Blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.
[5] Pumped storage facility production minus energy used for pumping.
[6] Wood, black liquor, and other wood waste.
[7] Municipal solid waste, landfill gas, sludge waste, tires, agricultural byproducts, and other biomass.
[8] Solar thermal and photovoltaic energy.
[9] Batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, and miscellaneous technologies.
[10] Included in "Conventional Hydroelectric Power."

Through 1988, all data except hydroelectric are for electric utilities only; hydroelectric data through 1988 include industrial plants as well as electric utilities. Beginning in 1989, data are for electric utilities, independent power producers, commercial plants, and industrial plants.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.05 billion kilowatthours.

Notes: • See Note 1, "Coverage of Electricity Statistics," at end of section. • Totals may not equal sum of components due to independent rounding.

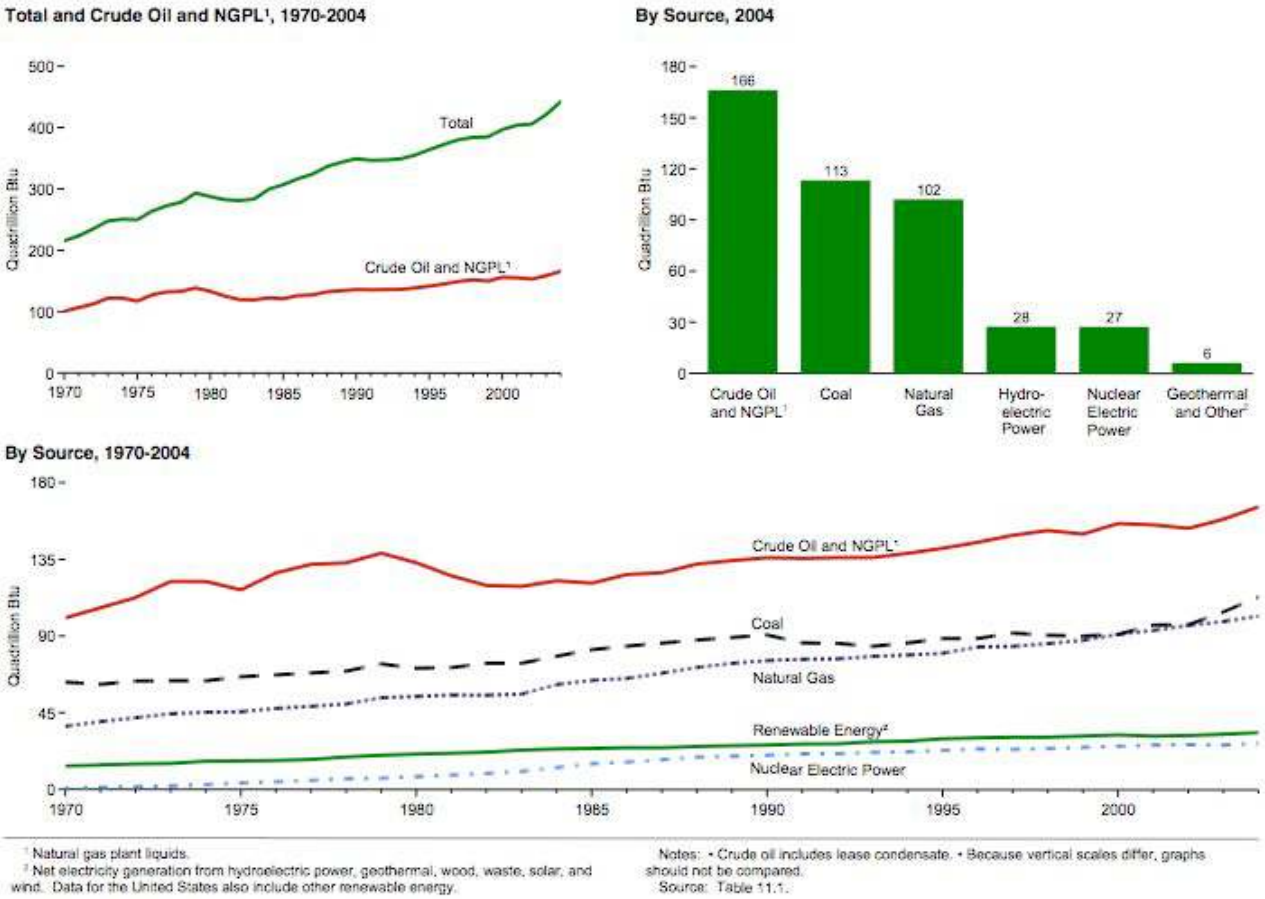
Web Pages: • For data not shown for 1951-1969, see http://www.eia.doe.gov/emeu/aer/elect.html. • For related information, see http://www.eia.doe.gov/fuelelectric.html.

Sources: • 1949-1988—Table 8.2b for electric power sector, and Table 8.1 for industrial sector. • 1989 forward—Tables 8.2b and 8.2d.

Fission is the new Fire

World Energy Market

Figure 11.1 World Primary Energy Production by Source



[1] Natural gas plant liquids.
[2] Net electricity generation from hydroelectric power, geothermal, wood, waste, solar, and wind. Data for the United States also include other renewable energy.

Notes: • Crude oil includes lease condensate. • Because vertical scales differ, graphs should not be compared.
Source: Table 11.1.

Fission is the new Fire

US Energy Consumption by Source

Energy Perspectives

Consumption by Source

Figure 5. Energy Consumption by Source, 1635-2005

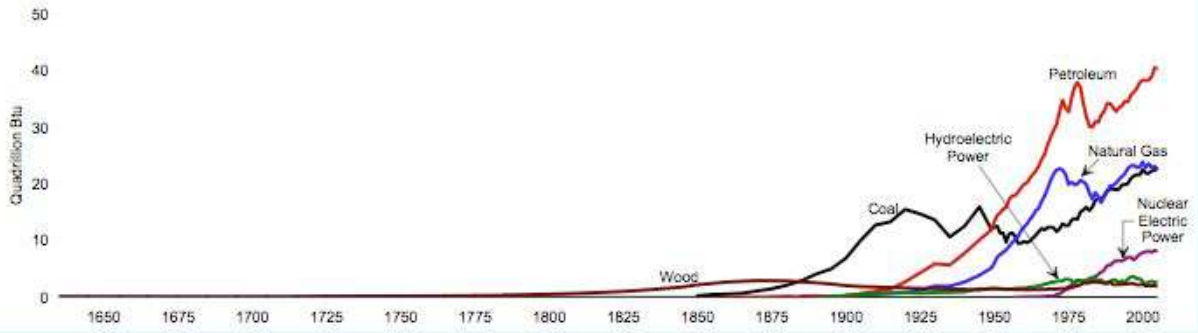
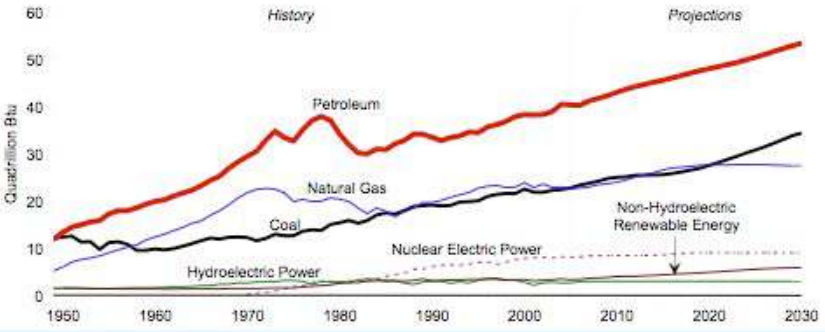


Figure 6. Energy Consumption History and Outlook, 1949-2030



In the long view of American history, wood served as the preeminent form of energy for about half of the Nation's history. Around 1885, coal surpassed wood's usage. Despite its tremendous and rapid expansion, coal was, in turn, overtaken by petroleum in the middle of the 20th century. Natural gas, too, experienced rapid development into the second half of the 20th century, and coal began to expand again. Late in the 20th century still another form of energy, nuclear electric power, was developed and made significant contributions.

While the Nation's energy history is one of large-scale change as new forms of energy were developed, the outlook for the next couple of decades (assuming current laws, regulations, and policies) is for continued growth and reliance on the three major fossil fuels—petroleum, natural gas, and coal—modest expansion in renewable resources, and relatively flat generation from nuclear electric power.

http://www.eia.doe.gov/emeu/aer/pdf/perspectives.pdf

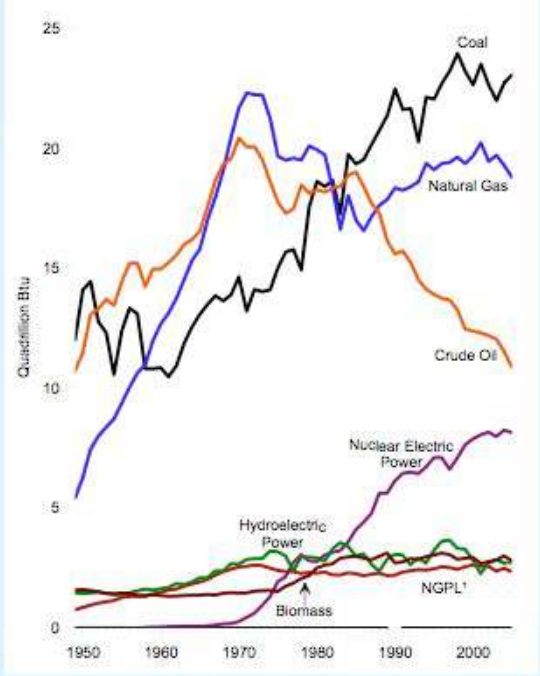
Fission is the new Fire

US Energy Production by Source

Energy Perspectives

Production and Trade

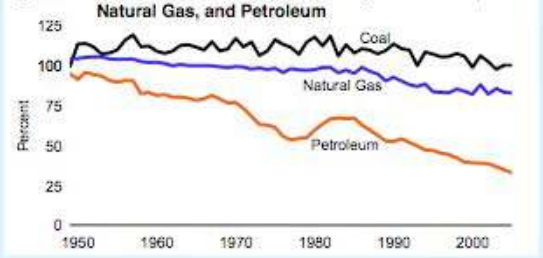
Figure 11. Energy Production by Major Source



¹ Natural gas plant liquids.

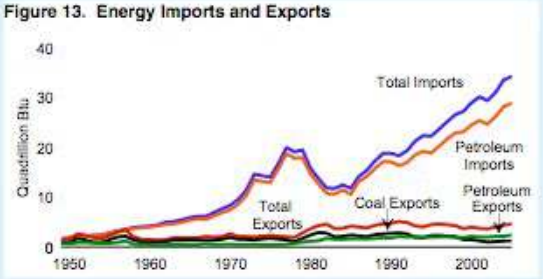
In the period studied, most energy produced in the United States came from fossil fuels—coal, natural gas, and crude oil. Coal, the leading source at the middle of the 20th century, was surpassed by crude oil and then by natural gas. By the mid-1980s, coal again became the leading energy source produced in the United States, and crude oil declined sharply. In the 1970s, electricity produced from nuclear fuel began to make a significant contribution and expanded rapidly in the following decades.

Figure 12. Production as Share of Consumption for Coal, Natural Gas, and Petroleum



The United States almost always produced more than enough coal for its own requirements. For many years, the United States was also self-sufficient in natural gas, but after 1967, it produced less than it consumed each year. Petroleum production fell far short of domestic demands, requiring the Nation to rely on imported supplies.

Figure 13. Energy Imports and Exports



Since the mid-1950s, the Nation imported more energy than it exported. In 2005, the United States imported 34 quadrillion Btu of energy and exported 5 quadrillion Btu. Most imported energy was in the form of petroleum; since 1986, natural gas imports expanded rapidly as well. Through 1992, most exported energy was in the form of coal; after that, petroleum exports often exceeded coal exports.

Fission is the new Fire

http://www.eia.doe.gov/emeu/aer/pdf/perspectives.pdf

Postulate - Fire sellers do not like fission

- Fossil (fire) sales - three trillion dollars per year
- From 1956 onward, fission captured 100% of the US submarine propulsion market
- Fission was on its way to capturing 100% of Navy shipbuilding market
- Between 1970-1990, nuclear power in the US captured 20% of the electricity market.
- Fission captured large electrical markets in France, Japan, Spain, the UK, Germany, Sweden, Switzerland, Lithuania
- Motive for Fear, Uncertainty and Doubt (FUD)?

Fire pushers ***talk*** about alternatives

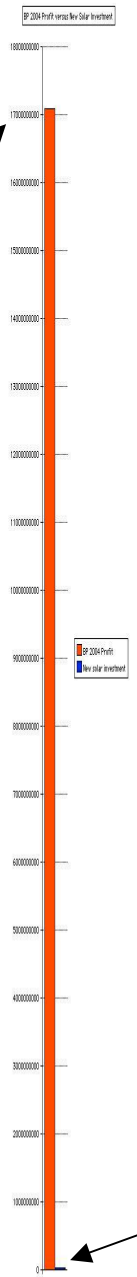
- BP calls itself "Beyond Petroleum"
- Chevron famously asks "Will you Join Us?"
- Shell tells us that they "Aren't just about oil anymore"
- You can find these campaigns on billboards, full page magazine ads, on the Internet, and on television.

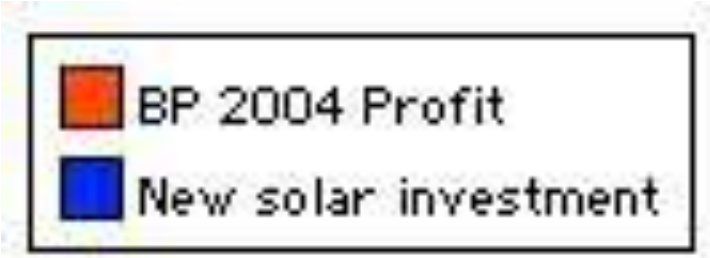
However

- It is nearly impossible to find a mention of nuclear or atomic power in fossil fuel company advertisements.

Illustration of fossil fuel profit versus alternative energy investment

$17,090,000,000





$25,000,000

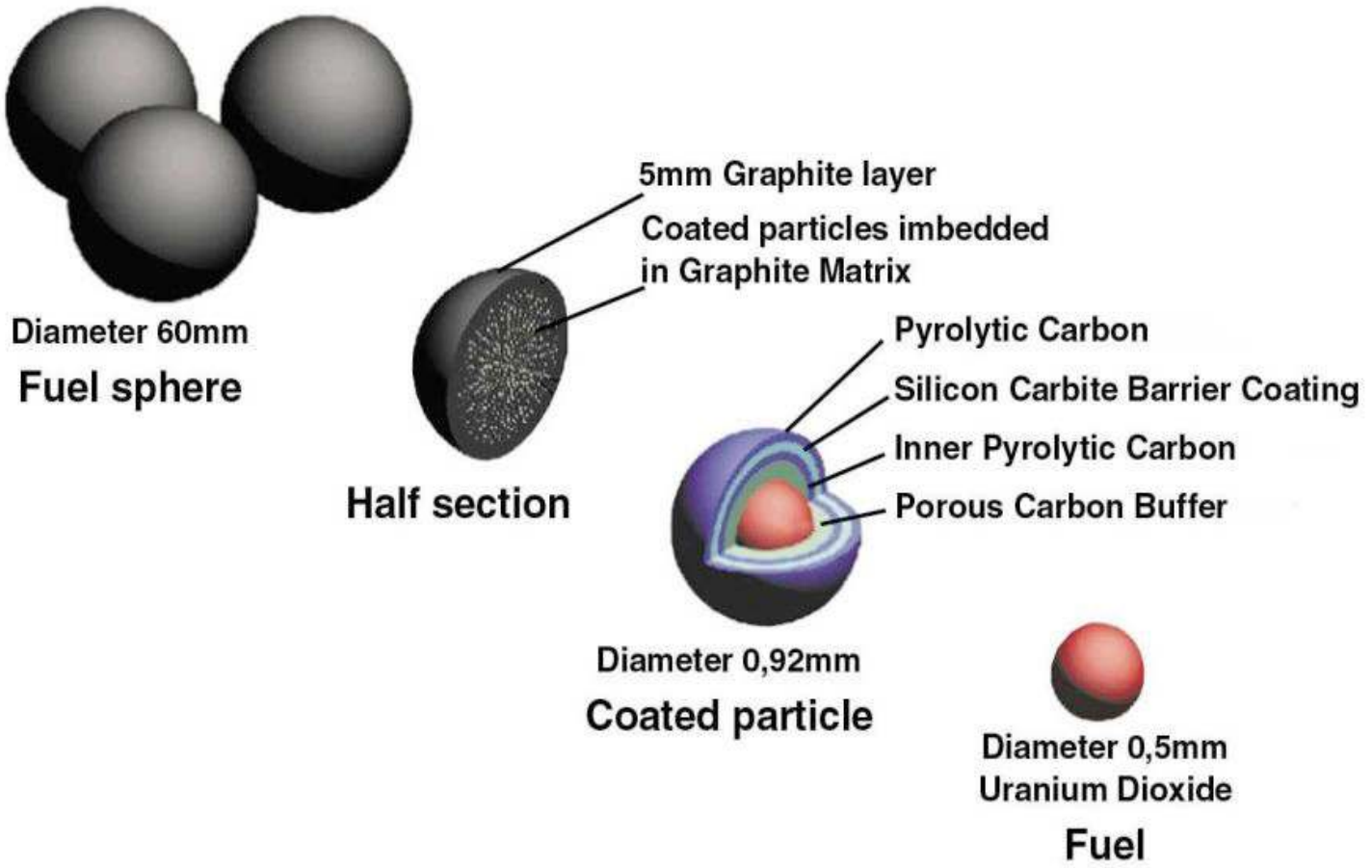
Fission is the new Fire

Think differently about energy.

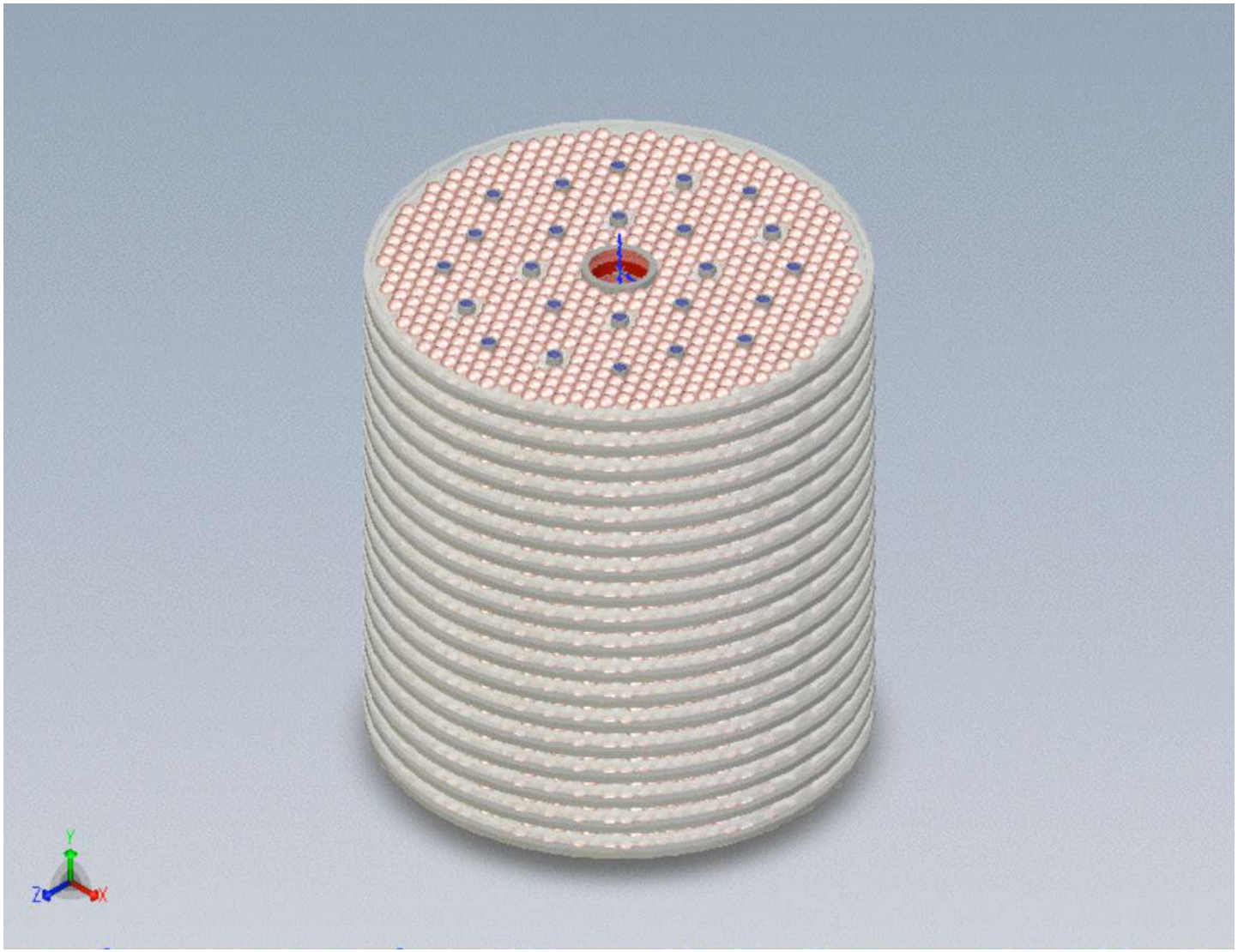
I Like

Pebble Power™

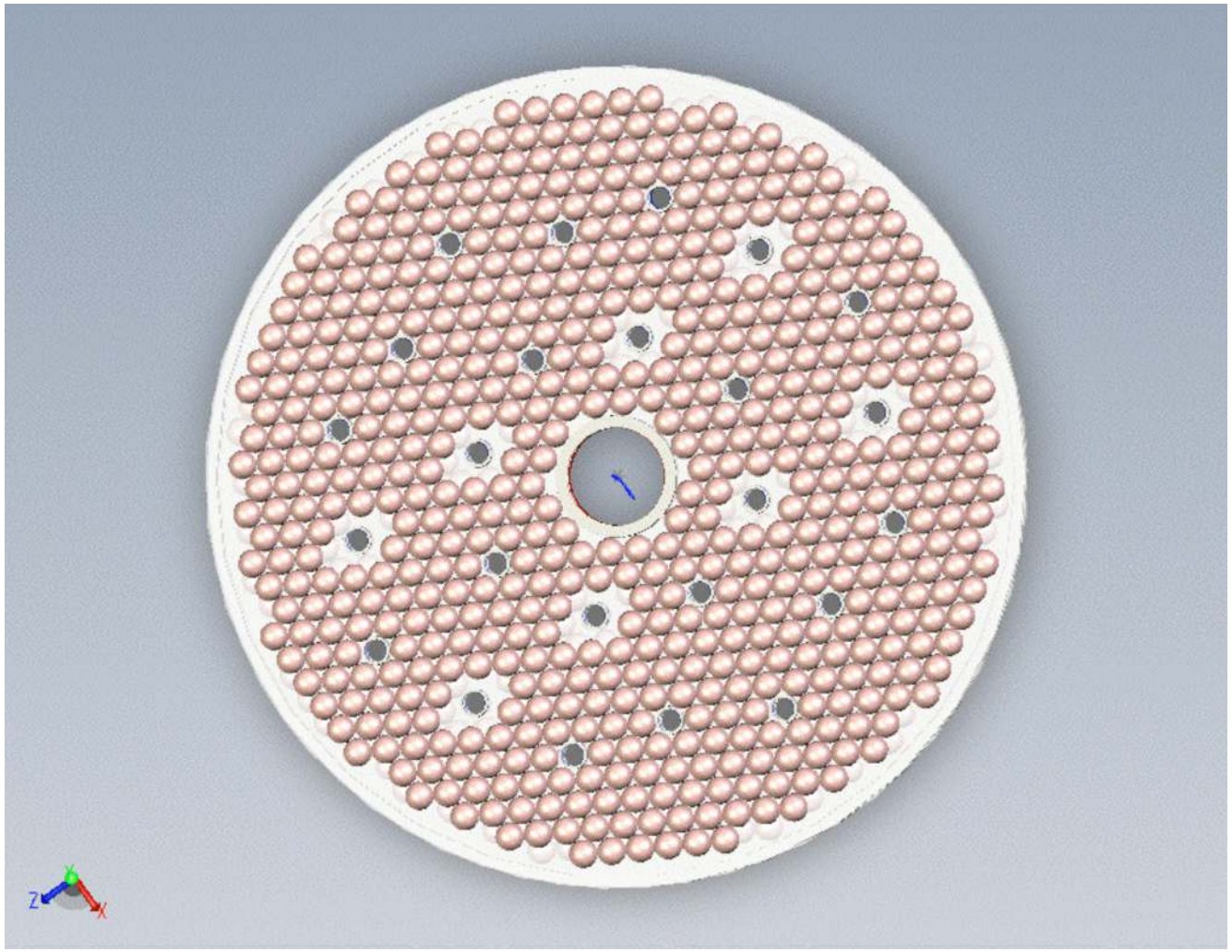
Pebble design



Pile of Power Pebbles™



Cross section view of Pebble Bed



Adams Engine™ Core Concept circa 1994

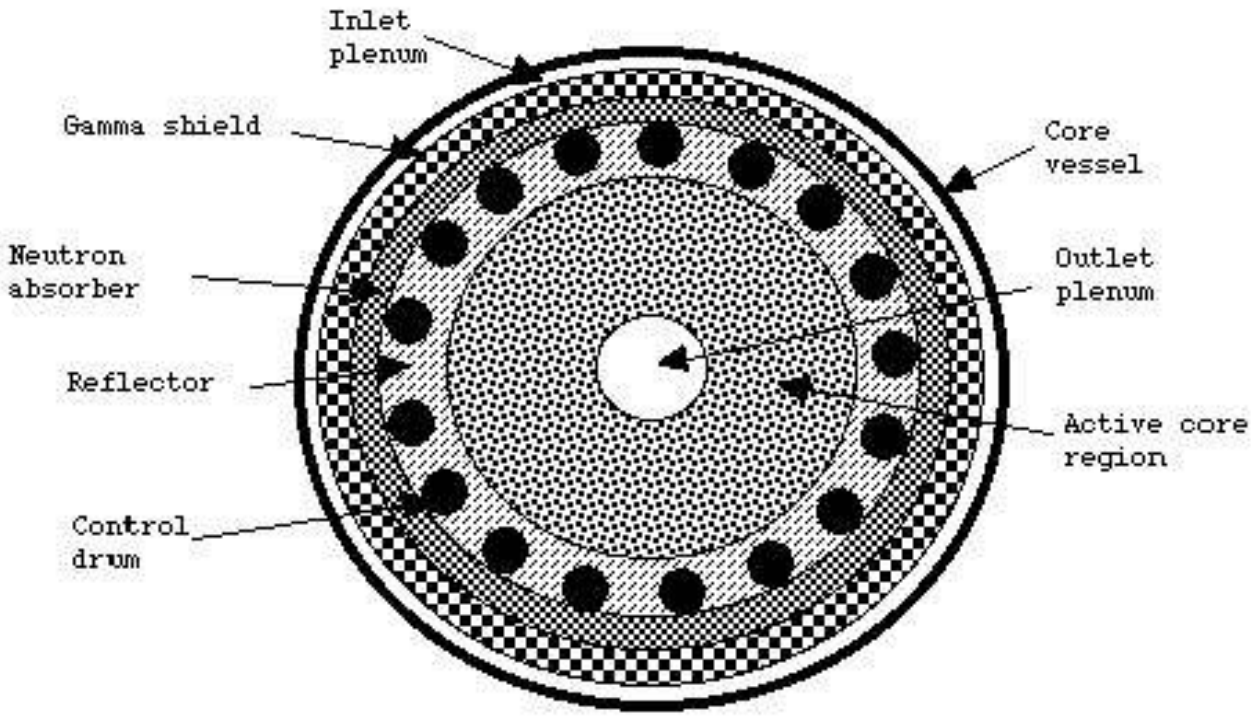
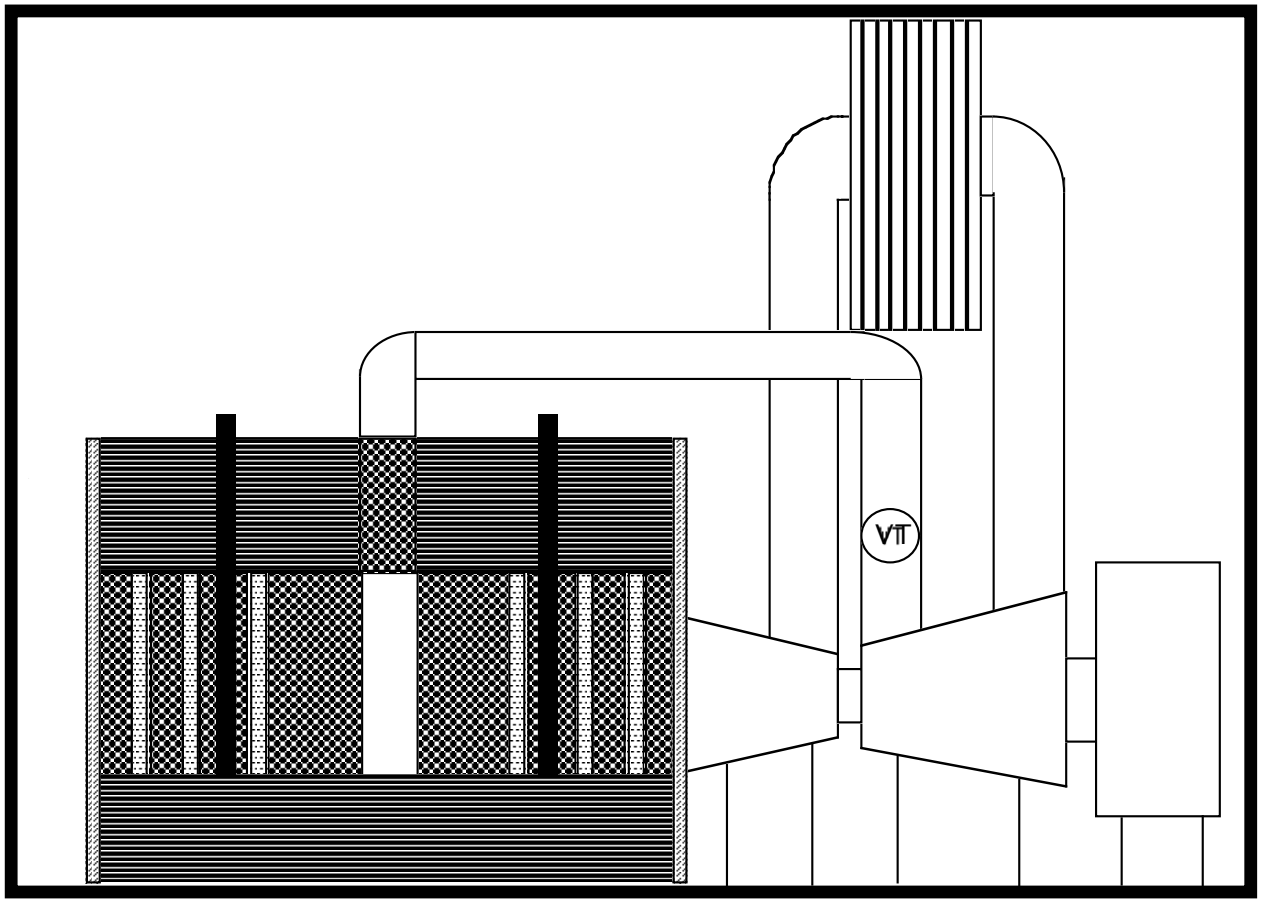


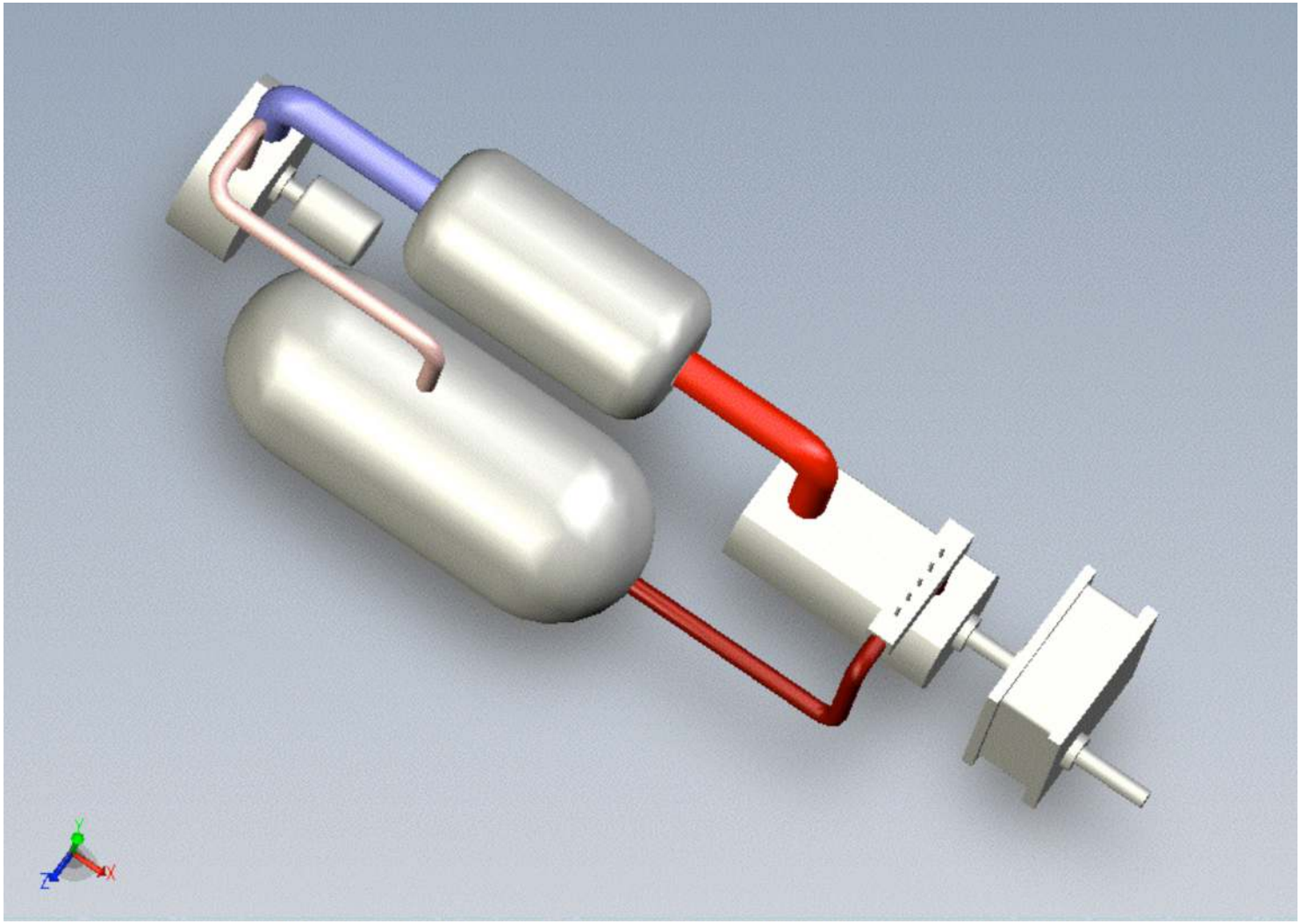
Figure 8. Core and Shield Configuration
(Cutaway view from top. Not to scale)

Adams Engine™ diagram circa 1994

Atomic Engine Concept



Adams Engine™



Backyard Atomic Power

Backyard Atomic Power

Interim storage of spent HTR fuel (pebble type) at Jülich / G