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DRAFT III

Tjernobyl plus 20 – the Swedish case

At a glance

The Barsebäck nuclear power plant has been closed down and by and large been replaced by expanded capacity at Ringhals, Forsmark and Oskarshamn nuclear power plants. No further premature closing down is foreseen. The emblematic year 2010 has been shelved.

Public opinion is gradually becoming more pro-nuclear. This holds over all age groups.

Swedish energy policy is now driven by the need to find a balance between economic competitiveness of Swedish industry and climate change policy.

There is no serious discussion about building new reactors at the three existing power plants.

The evolution of politics

The second and last reactor at Barsebäck went off-line May 31, 2005. Thus ended a story that started more than 30 years ago. Barsebäck I closed down 1999. Closing down Barsebäck also in effect meant closing down the nuclear issue in Swedish politics. Gone is the magic year “2010”.

In order to explain the closing down of Barsebäck one has to go back to the year 1997, when a political agreement was struck between the social-democratic government and the Left party (the partially reformed communist party) and the Centre party, the bourgeois party that has been opposed to nuclear power since the early 1970’s. This agreement was, in turn, made possible by an extensive co-operation between the government and the centre party over budgetary policies plus a series of other issues. This co-operation was a de facto informal coalition government without ministerial representation by the centre party. This reflected a long standing historical pattern in Swedish politics of on-and-off co-operation between the two parties. This co-operation ended at the election in 1998 and has been on the back-burner since then.

And in order to explain the year 1997 one has to go back to the previous agreement in 1990 between a social-democratic government, the centre party and the liberal party. This agreement reflected a climbing down by the social-democratic government from an attempt to start phasing out Barsebäck in mid to late 1990’s and thus at an earlier date than the 2010 that was stated in 1980. This premature closing down was in turn the outcome of a major policy review carried out after the Tjernobyl disaster in 1986. This review led to a decision in 1987 to start phasing out Barsebäck in the mid 1990’s. However, the then social-democratic government never managed to agree with the Swedish trade unions about the conditions for this dismantling. The worsening economic conditions in late 1980’s and early 1990 thus forced the social-democratic government to climb down.

The 1987 decision in turn was triggered by the rather serious impact from the fallout from Tjernobyl together with the fact that the social-democratic party in 1980 (at that time in opposition) had committed itself to phase out all nuclear power by the end of 2010.

And this commitment to 2010 was, of course, directly tied to the referendum in 1980 which in turn was triggered by the fact that the Three Mile Island accident occurred less than six months before the parliamentary elections in 1979. At that time the social-democratic party was in opposition and did not want to fight an election campaign over the future of nuclear power. So the TMI issue was de-fanged through the decision to have a referendum. Ever since then, the year 2010 has figured in the Swedish energy policy.

So it remains to be explained why the social-democratic party was so worried about having nuclear power in the 1979 election campaign. The answer again has to be sought in earlier years: the social-democratic party lost the election in 1976 partly over nuclear power and had since then refused to reach a compromise with the bourgeois parties which were then in government.

And the election was lost in 1976 partly because the Swedish nuclear power program at that time was exceptionally large on a per capita basis. Also, the social-democratic party thought, together with large sections of Swedish industry, that nuclear power would be an excellent export industry. Sweden was one of four countries without a nuclear weapons program that nevertheless had an indigenous nuclear power industry (the other three were Japan, Germany and Canada) and the only OECD country that developed a LWR design without licenses from US companies. Thus the Swedish industry was understandably proud of its technological and industrial achievement. ASEA had formed a joint venture with the Swedish state, ASEA-ATOM, and produced nuclear fuel as well as reactor designs for a Swedish BWR design.

The state, moreover, became involved in nuclear technology right after the war. The first attempt to design nuclear power reactors was based on a heavy water design that would make Sweden independent of enrichment services and also open up a nuclear weapons option. This option had strong backing from the military establishment in the late 1950’s and was abandoned only after a heated political debate. The military also gradually realised that nuclear weapons were costly and impossible to use against an invading Soviet Union. The dual purpose technology program was important, however, in establishing a broad base of technological expertise, ranging from reactor design to reprocessing. ASEA-Atom was founded when the state abandoned the indigenous heavy water power reactor design.

The reason why the nuclear issue became so contentious in the 1976 election goes back to two factors: the centre party was at that time the biggest opposition party and this party had turned sharply anti-nuclear. When the centre party was able to form the government in 1976 one of the first decisions the new prime minister had to take was to allow Barsebäck II to go critical (although he had promised in the election campaign never to do this). The energy minister in this the first non-social-democratic government in 44 years was the same person who then made an agreement in 1997 about closing down Barsebäck. And after that he retired.

So the closing down of Barsebäck has long roots. At the same time, the change in government in 1976 had another consequence: the nuclear power industry had to start a crash-program for managing the high-level nuclear waste. This, it is now generally acknowledged, was a blessing and started a process that has made Sweden one of the forerunners in nuclear waste management. A site will be decided upon within a few years.

And then again – the blessing could yet turn out to be a poisoned chalice. Being up-front on the nuclear waste issue invites interest from other countries that have not been as far-sighted. As long as nuclear waste management is not part of the European internal market this is no big deal. We shall see what comes.

Nuclear power in the Swedish energy supply system

The Swedish energy supply system has its peculiarities when compared to other countries. Some noteworthy features (statistics from the report Energy in Sweden 2005 from the National Energy Agency, see www.stem.se):

The Swedish economy is very electricity-intensive. On a per capita basis, Sweden is more than twice as electricity intensive as Germany (17 000 kWh in 2002 compared to 7 000 kWh in Germany). At the same time, Sweden is CO2-efficient – the CO2 emissions per capita and per unit of GNP are roughly half the levels of Germany. The following table (excerpts from table 24 in the report above) demonstrates this. As can be seen, Sweden has the largest nuclear power production per capita in the world.

Table 1: electricity production in kWh per capita, 2003 (from table 24). Hydro includes wind

Power source	Sweden	Finland	Switzerland	France	Germany	Japan	OECD average
Hydro	6 016	1 858	4 978	1 060	529	850	1 224
Nuclear	7 525	4 363	3 710	7 167	2 000	1 881	1 926
Fossil	956	7 992	135	903	4 574	5 336	5 312
Biomass, waste	289	1 952	219	82	162	139	147
Total	15 136	16 165	9 042	9 212	7 265	8 206	8 609
Exp/imp	1 429	940	- 429	- 1 072	- 5		16

There are two reasons for this: first. Swedish industry is heavily tilted towards steel and paper and pulp and, second, the Swedish housing sector is heavily tilted towards electric heating.

This latter fact was, in turn, one of the key markets for the expanding nuclear power in the 1970's and 1980's.

The Swedish electricity production is essentially based on hydro-power and nuclear power. Fossil fuels play a marginal role. So does wind energy, although the capacity is expanding rapidly.

The Swedish energy supply system has two other peculiarities: the biomass share is large and coal and natural gas plays a very small role. In fact, Sweden has the lowest share of natural gas in any of the EU member states.

Biomass has expanded rapidly since the early 1970's and is used both in industry (mainly paper and pulp industry) and in domestic and district heating (see table 2)

Table 2: fuel supply to Sweden, (excerpts from table 9 in report above), TWh

Fuel, TWh	1970	1980	1990	2000	2004
Oil products	350	285	191	197	205
Coal	18	19	31	26	30
Natural gas	-	-	7	8	9
Biomass	43	48	67	91	110

. The total amount of biomass has increased some 250 % since 1970 and is now larger than the amount of oil used outside the transport sector. Biomass has grown rapidly for a variety of reasons, not the least since a carbon tax was introduced on fossil fuel in 1990.

The Swedish taxation system has been gradually tilted against energy in general and CO2 emissions in particular (see table 3).

Table 3: energy taxes in Sweden in 2004 in million SEK. From the annual report of STEM

Energy source	Energy tax	CO2 tax	Sulphur tax	Total
Gasoline	14 334	11 046		25 380
Oil products	3 700	14 034		17 734
Tallolja	22			22
Other fuels	107	1 112		1 219
All fuels			93	93
Electricity	17 216			17 216
Nuclear power	1 860			1 860
Total	37 239	26 192	93	63 524

Taxes on energy and CO2 make up 10 % of total tax intake to the state and 2.5 % of GNP. Clearly, the amounts are not trivial.

This is particularly obvious when seen against the total price of fuels paid by users, as can be seen in table 4 below.

Table 4: energy taxes on different fuels, as percent of total price 1970-2004. from STEM report

Fuel	1970	1980	1990	2000	2004
Gas oil	16.4	9.4	33.6	40.9	52.6
Heavy fuel oil	14.8	12.6	41.2	50.7	66.6
Diesel oil	61.2	8.5	27.4	43.3	48.1
Coal	-	-	53	79.6	86.5
Biomass	-	-	-	-	-

Clearly, taxation has been used not only for as a source of revenue for the state but also as a tool for influencing consumer behaviour.

Similarly, households have had to pay much more for electricity over the last few years. Taxes on the electricity used for electric heating has increased from 6.5 % in 1970 to 40 % in the year 2004 (when the price was some 0.12 euros per kWh). Taxes on electricity to industry have disappeared, however.

These tax increases have been part of what has been called a shift from taxes on income to taxes on the consumption on certain natural resources (electricity, fossil fuels, gravel, solid waste and waste incineration).

The Swedish nuclear industry

The once large Swedish nuclear industry is now much smaller and not Swedish. The export market never materialised and the engineering capacity has been wound down.

The early development of the Swedish nuclear industry followed the same pattern as in other countries based on LWR –designs.

The LWR designs have their origin in the US nuclear navy program, and US companies that supplied the navy with technology got a head start. Once nuclear electricity production became a commercial possibility the companies that traditionally supplied technology to the electric utility industry stepped in. Westinghouse and General Electric started in the US with a respective PWR and a BWR design. These designs were then licensed within the commercial networks that existed since the early 1900's. Westinghouse licensed its PWR design to Siemens and the French company Framatome plus Mitsubishi in Japan. General Electric licensed its BWR design to the German company AEG (the German name of the company translates itself into General Electric in English) and to Hitachi and Toshiba in Japan. The Canadian nuclear industry was based on an indigenous Canadian HWR design and the British nuclear industry had several more or less false starts with indigenous designs before finally settling down with a LWR design.Two other US companies entered the market but now from another supply chain: Combustion Engineering and Babcock&Wilcox had their roots in steam vessel designs.

The core of the once Swedish nuclear industry consisted of ASEA-Atom, which started out as a joint venture between ASEA and the Swedish state. The core business was fuel manufacturing, reactor design and services to operating reactors. Turbines were produced by STAL and reactor vessels by UDDCOMB in southern Sweden. The latter company was a joint venture between Swedish steel company Uddeholm and the US company Combustion Engineering.

The first ASEA-Atom reactor design was based upon a Swedish BWR design (for many years the only non-US LWR design in an OECD country).

The Swedish state power board never accepted to become dependent on Swedish designs only and opted for a Westinghouse PWR design for three of the four units at Ringhals power station (the fourth unit was the ASEA-Atom BWR design). Thus the Swedish nuclear power sector is based on both BWR and PWR designs; seven of the former (originally nine, but the two units at Barsebäck are now closed) and three of the latter.

ASEA-Atom became a wholly owned subsidiary of ASEA in the late 1970's. ASEA in turn merged with Brown Boveri into Swiss-Swedish corporation (conglomerate) ABB in 1988. ABB in turn bought Combustion Engineering (which in turn nearly bankrupted ABB once the asbestos liabilities became obvious). ABB sold all its nuclear companies to BNFL in 1999, which merged these companies with Westinghouse (which BNFL had bought earlier). BNFL in turn sold Westinghouse to Toshiba in 2005.

The original company ASEA-Atom still exists as a unique company, although the name has changed a number of times. As a nuclear fuel company and its related service arm it has always been profitable, but the many changes in ownership clearly demonstrate the commercial weaknesses of the nuclear supplier industry.

The world PWR nuclear industry now consists of one European company, a merger between Siemens-owned KWU and Framatome, and two Japanese companies Toshiba-owned Westinghouse and Mitsubishi. The world BWR industry similarly consists of one US company, General Electric and two Japanese companies, Hitachi and Toshiba-owned Westinghouse. Quite a change during the last fifteen or so years.

The Swedish electric utility industry

The Swedish nuclear power program was, for quite some time, the by far largest when measured as installed capacity per capita. According to NEA:s report Nuclear Energy 2005, two countries stand out in terms of nuclear electricity production per capita: Sweden and France with 8 and 7 MWh/capita. Germany, Japan, Korea, Canada and the US all have per capita productions ranging between 2 and 3 TWh/capita.

The difference with France is telling. The French expansion was due to a co-ordinated effort between a state-owned nuclear reactor industry, a state-owned nuclear fuel cycle and a state-owned electric utility.

The Swedish system was entirely different and more decentralised. Nevertheless this system managed a similarly co-ordinated effort as the French administration. The explanation lies in the de-centralised co-ordination that in Sweden was managed by the Swedish industry under the leadership of the Wallenberg group of industries and the Swedish state under the leadership by the social-democratic government.

The Swedish electric utility industry was very stable for the first 90 or so years of its existence and has since then changed very rapidly.

The electric utility industry has – or had – two distinct characteristics that separated it from many other countries.

The first characteristic was the multitude of ownership, which in turn had two roots.

The first root was hydro-power, which was largely developed by heavy industry such as steel and paper and pulp. These companies used to own large amounts of forested land and thus also owned the river banks and thus the rights to develop the hydro power potential. The Swedish state also started very early to develop hydro power through the newly formed State Power Board (1909).

The second root was thermal power produced by many cities. These cities rapidly developed their own electric distribution system and also ownership of power production.

The second characteristic of the Swedish electric utility industry followed from the two roots of production: the separation between production, whole sale transmission and distribution. The production was dominated by a mix of state, heavy industry and cities. The high voltage system was, after some pirouettes in the mid 1940's, owned by the State Power Board. The distribution system to small consumers was essentially controlled by local authorities.

This system required a large amount of co-ordination, and various mechanisms and arenas were developed to carry out this. The Wallenberg sphere controlled ASEA, the electric utility Skandinaviska Elverk and a large share of the electricity using industry. The social-democratic government had a long history of co-operation with Swedish business in general and the Wallenberg sphere in particular. Thus the expansion of nuclear power in the late 1960's and 1970's were carried out by a multitude of actors including the state, private industry and large cities. Nuclear power thus had a very broad base of political and industrial support.

All this changed in the early 1990's. Three streams of events became intertwined.

First, deregulation of the Swedish electricity industry and the opening up of the Nordic electricity market. Competition increased and the electricity industry began to restructure and consolidate. Also, the transmission grid was lifted out of the State Power Board and given over to a specific government agency.

Second, Swedish industry went through a major recession (in turn the outcome of a financial bubble due to a previous deregulation of the financial industry). That together with new business models (fashions) led to major divestitures of electricity generation from the previous industrial owners.

Third, many cities went through major economic difficulties and sold their public electricity production units and sometimes also distribution systems.

The net result of these three intertwined series of events was a rapid consolidation of the electricity generation industry. This is now dominated by three large companies, of which only Vattenfall (the previous state power board) is Swedish. The second largest old Swedish utility, Sydkraft, which was owned by the cities in southern Sweden, is now a wholly owned subsidiary of E.on. The Finnish energy conglomerate Fortum (the Finnish state is a majority owner) has taken over the Stockholm city energy company. Thus the three nuclear power stations Ringhals, Oskarshamn and Forsmark are essentially owned by Vattenfall, E.on and Fortum. Private or municipal Swedish ownership, which once had a large share, is now marginalised.

Electricity prices before taxes have increased rapidly over the last few years. The links between electricity users, large and small, and electricity production have been severed. The very broad based political support that the electricity industry previously had has now become markedly narrower.

Also, Vattenfall has become a large company in Germany. It is very concerned about being seen as a loyal German corporate citizen and is thus in many ways less focussed on serving Swedish industry.

One important element of the old structure remains, however. That is the joint company set up to serve the back end of the nuclear fuel cycle, SKB (Svensk Kärnbränsleförsörjning, or the Swedish nuclear fuel supply company). SKB is wholly owned by the reactor owners (thus now Vattenfall, E.On and Fortum plus marginal other Swedish private and municipal interests) and operates the spent fuel storage at Oskarshamn. SKB will apply for a permit to establish an encapsulation plant in 2006 and a final repository in 2008. Plans are that this repository will start operation in 2017.

Swedish legislation states that only Swedish spent fuel can be stored in Swedish facilities. It has so far been accepted wisdom that the EU internal market legislation does not cover spent fuel services. If this wisdom were to be successfully challenged in the European Court of Justice, the difficulties of finding a site would multiply.

Public opinion

The SOM institute at Göteborg university annually carries out opinion surveys over the view of the public about nuclear power. The message is clear.

In 1987, the year after Tjernobyl, 78 % of all Swedes were in favour of abolishing nuclear power in Sweden. This figure was down to 36 % in the year 2004.

There are no significant differences between age-groups. In 1987 the group 15-29 was the most critical (80 % wanting to abolish nuclear power) while the age group 50-64 was the most positive (only 75 % wanting to abolish). In 2004 the same figures were 42 and 33 % respectively.

Neither is there any noticeable difference between persons with university education or only basic education. The difference between men and women is consistent but small: around 10 % with women being more sceptical.

There is only one characteristic that does differentiate: political parties.

- Social-democrats have between 1987 and 2004 changed from 80% wanting to abolish nuclear power into 35%.
- The conservatives have changed from 64 % to 18 %
- The liberals have changed from 79 % to 31 %.
- The greens (which is a much smaller party) have changed from 84 % to 66 %

The difference between those wanting to use nuclear power and those wanting to abolish nuclear power shifted in the year 2002 from being negative to positive. In 2004 45 % of the population wanted to continue using nuclear power while only 36 % wanted to abolish it. The trend is consistent over time.

The RBMK and Tjernobyl

The Tjernobyl disaster had a large but temporary impact on Sweden. Large areas in north and mid Sweden were contaminated. The fall-out should be compared to the fall-out from the nuclear weapons tests, however. There is also a difference between different isotopes.

The Swedish radiation protection institute reports that the total fall-out from Cesium-137 was 3 kBq/m2 from the nuclear weapons tests in late 1950's and early 1960's and 10 kBq/m2 from Tjernobyl. The former was relatively evenly distributed around Sweden while the latter was much more concentrated.

The fall-out of Strontium-90 was on average 2kBq/m2 from the weapons tests and very limited from Tjernobyl.

The content of Cesium-137 has also been measured in milk for human consumption. The concentrations differ substantially over the country and over the years, depending on precipitation patterns from the Tjernobyl accident. The average over the whole of the country shows two distinct peaks (at 6 Bq/l) at 1964 and 1986. In 1985 the content was very low. Strontium-90 measurements demonstrate one peak in 1964 (1.4 Bq/l) and thereafter a steady decline to less than 0.1 Bq/l.

These experiences led the Swedish government to organise a large assistance programmes for RBMK reactors in the former Soviet union, after the break-up in 1991. Considerable efforts have been made to increase the safety in the two reactors in Ignalina in Lithuania. Closing down Ignalina was also a condition for Lithuania joining the EU. So far, one reactor has been closed and the second is scheduled to close in 2009:

The Swedish authorities have also made considerable efforts at the second RBMK power station close to Sweden, Sosnovy Bor outside St. Petersburg in the Leningrad Oblast. Less money has been spent, but there have been extensive training programs and some upgrading of monitoring instruments. It is a reasonable guess that the safety of the Sosnovy Bor power plant has increased, and it also seems that the experiences from this power stations are now being transferred to other RBMK power plants in Russia.

The major weakness of the RBMK reactor designs remains, however. The reactor is potentially unstable under certain conditions. Also, there is no containment.

Climate change policy

Swedish energy policy and thus also electricity policy is now dominated by climate change concerns.

Sweden is, compared to many other countries, CO_2-efficient. See table 5 (from STEM)

Table 5: CO_2 emissions in tons per capita, per unit of GNP and emission changes 2002/1991

Country	CO_2/capita (tons)	CO_2/unit GNP (USD)	Emission changes % 2002/1991
Sweden	5.6	0.17	- 3.9
Finland	12.21	0.38	16.9
Switzerland	5.87	0.13	-2.8
France	6.16	0.21	2.3
Germany	10.15	0.31	-6.4
Japan	9.47	0.21	14.6

Swedish CO_2-emissions peaked in the early 1970's and declined over the 1970's and 1980's. Since 1990 the emissions have by and large been stable and variations from year to year depend on winter temperature, precipitation – and thus the need to use fossil back-up power – and business cycles. The emissions of greenhouses gases taken together have fallen slightly since 1990.

The future, however, is something else. Stated policy by the present social democratic government - which is in an informal coalition with among others the green party – is that

- Average yearly greenhouse gas emissions for the period 2008-2012 should be at least 4 % below emissions in 1990 (without taking into account of carbon capture in biomass or flexible mechanisms);
- For the year 2020 the total emissions of greenhouse gases should be some 25 % lower than in 1990:
- For the year 2050, the per capita emissions of greenhouse gases should be some 4.5 tons of CO_2 equivalents.

The feasibility obviously depends on a number of issues, including future policies. Present policies consist of a number of elements, of which the key ones are:

- Continued use of energy and carbon dioxide taxes
- Continued use of emissions trading
- Increasing capacity in existing nuclear power stations, thus in effect compensating for the closing down of Barsebäck

- Stimulating renewable electricity generation through i.a. green certificates. The present goal is increase electricity generation from primarily wind and biomass by some 10 % of total electricity generation up to the year 2016 (or 17 TWh). .
- Stimulating production of biomass-based fuel for the transport sector.

The last two items in turn depend on technological development and innovation. The natural resource base is very favourable, compared to many if not most other EU countries. Also, wind energy has been somewhat of a step-child in the Swedish electricity industry and has only lately started to expand rapidly. Likewise, the goals for the transport sectors are now extremely ambitious and will to a large extent depend on technological innovation. One very promising technology is pressurised black liquor gasification within the pulp and paper industry. If the prototype holds what it promises another 10 TWh of electricity could be produced or some 30% of Swedish needs of transport fuel.

The longer term success of such an ambitious climate policy will depend on “the animal spirits” of the entrepreneurs (to use Keynes’ phrase). Innovators, entrepreneurs and industry at large have to be confident that an ambitious climate policy will remain in place and that venture capital starts to warm to the potential.

Phrased in another way: one condition for this is that a new consensus of energy policy can emerge that is independent of shifts in government or government policies.

This should not be impossible. The basic tradition of government-business relations in Sweden is one of dialogue and mutual adaptation rather than trench warfare or litigation. This is true also for social-democratic governments; one key example was that it was the pulp and paper industry which in the early 1960’s went to the government and suggested a joint approach to reduce environmental pollution from industry.

In the end, however, much will depend on how the international scene plays out.

Nuclear revival?

The future of the existing nuclear power programme in Sweden will be determined by climate policy. Given the present trends of the debate, a closing down of further reactors looks increasingly unlikely. The environmental movement is concentrating on climate issues and will in all probability be severely split if further reactor shutdowns are pushed for.

Finland’s new reactor, no 5, will have an impact on the Swedish debate. This reactor is financed by the electricity using industry. A similar situation could occur in Sweden, but a participation in a unit 6 in Finland is also a possibility.

A revival on the European scale will probably depend on adequate progress on the nuclear waste issue. Sites will probably have to be identified. The two nuclear weapons states France and the UK have a special situation, since they in any circumstance will have to identify sites for military programmes (nuclear weapons as well as naval reactors). Sweden and Finland appear to be furthest along with waste facilities among the countries with civilian programmes only. It is an open and interesting question whether other countries with civilian programmes only can proceed with a nuclear power revival without progress on the waste issue. Germany is the key country here.

A side issue is whether a European nuclear waste policy will consist of national programmes only – each and everyone for himself – or whether an internal market can be arranged. It is unlikely but perhaps not altogether inconceivable that Finland and Sweden eventually would take on the role as European sites for final disposal. But as in so many other areas of nuclear power – time has to ripen. Were the issue to be pushed prematurely the response would in all likelihood be a decided NO and thus a road-block.

A possible revival of nuclear power in Europe would also depend on the economic competitiveness of the alternatives as well as the present discussion on energy security. By and large climate policy is likely to decide. With a continued emissions trading system (or equivalent programmes) the alternatives depend on technological progress. One would be carbon sequestration on a large scale, assuming that technological and regulatory issues can be resolved. Another would be a major shift towards distributed electricity generation, based on wind energy, solar electric, natural gas fuelled fuel cells (in combination with heat recovery) and so on. Here the two main hurdles would be technological and cultural: a distributed electricity system would require a fundamental reformation of the existing electricity generating industry. Something like the reforms that have been witnessed within the telecom industry with the advance of decentralised cell phones. Or the reformation of the catholic church in the 16th century. No small shift, given the cardinals and cathedrals of the existing electric utility church.