

338

AMQ
International's

STRATEGIC ASSET MANAGEMENT



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Win that argument! - with ARGUMENT MAPPING

Are you familiar with Argument Maps?

They are extremely useful for taking the heat out of complex questions and unscrambling conflicting ideas. Use them to assess your own arguments as well as the arguments as others. Use them also as a means of communicating the development of proposals that can be expanded to include the ideas and objections of other members of your organisation. Argument Maps rely on logic, organisation and structure rather than on our charisma or powers of oration.

In this issue, we

Look at how to construct an Argument Map and

Illustrate its use by applying it to a particularly contentious field of debate - whether or not we should adopt nuclear energy. The example presentation I have chosen is by Adam Lucas of the University of Wollongong. It was broadcast on Ockham's Razor (date). Although there are many other broadcasts on this topic, I have chosen this one because Adam has nicely grouped his arguments around the 5 main questions that anyone considering an AM proposal will also have to consider, namely:

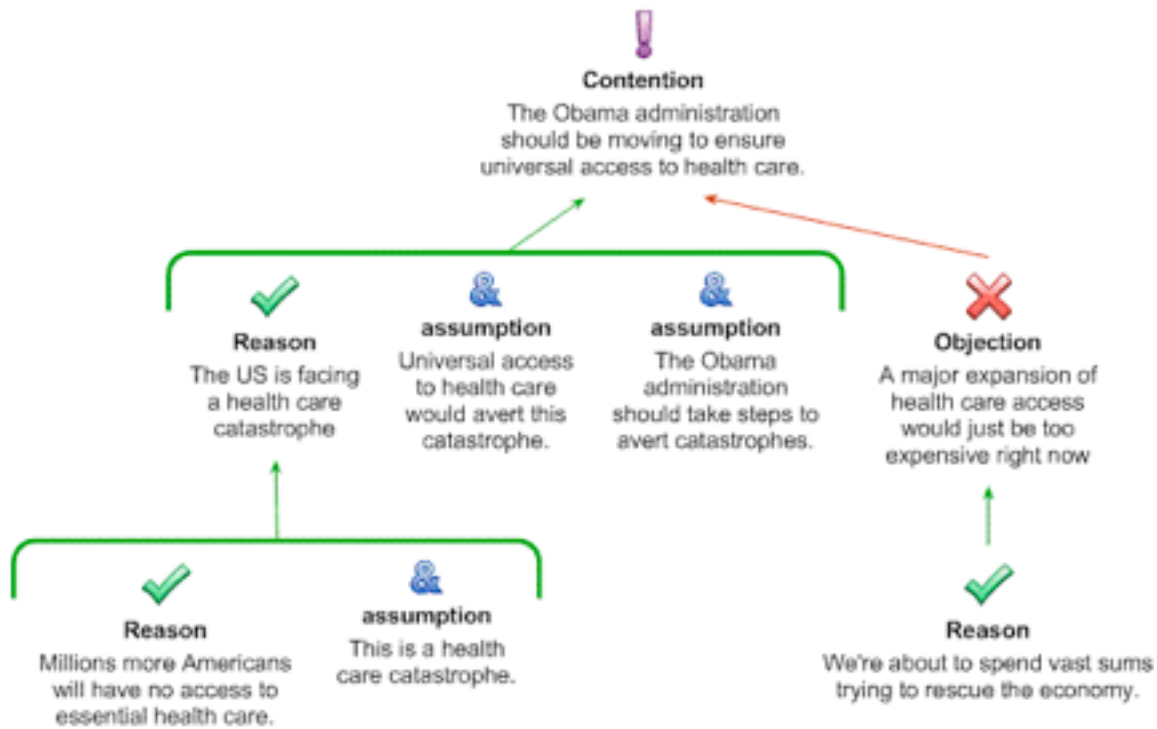
- Is it safe?
- Is it reliable?
- Is it available?
- Is it Cost Effective?
- Is it environmentally supportive?

The Argument Map will also work for less contentious issues and is a great way of organising your information as you progress in your role as 'Integrator'

Give it a try! And enjoy. *Penny.*

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WHAT IS AN ARGUMENT MAP?



This is an example argument map from the blog of Tim Van Gelder (www.timvangelder.com) (*This is an excellent blog and worth adding to your list with tools that can help you develop stronger arguments and present them more clearly. Tim is also interested in 'informatics' - the graphical display of information.*)

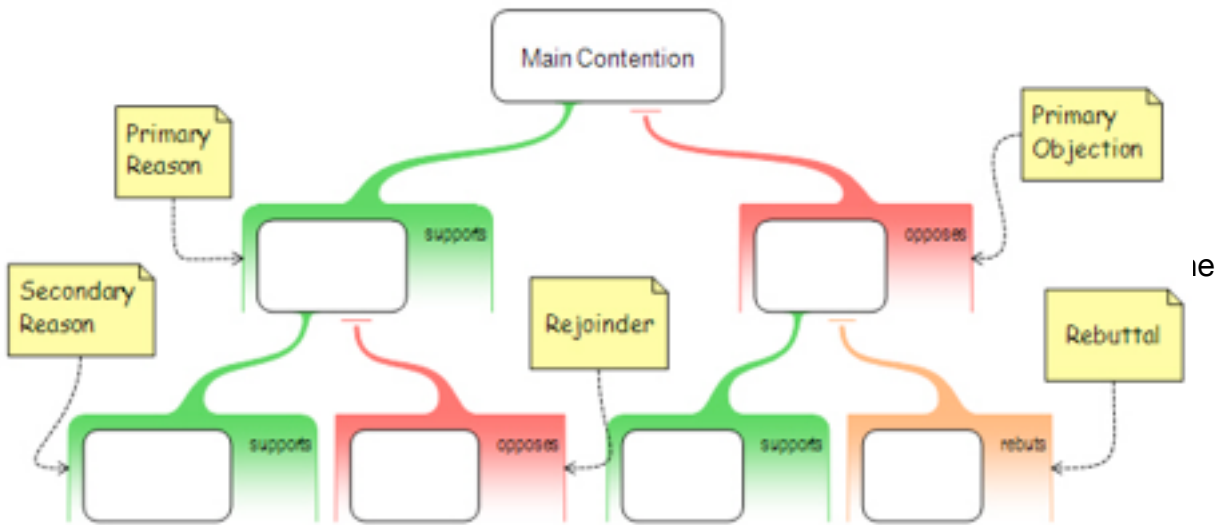
The map diagrams a portion of the argumentation found in an opinion piece by Paul Krugman. The map uses colors, lines, position in space, labels and icons to convey the structure of the argumentation. Note how the visual conventions display one distinctive feature of argumentation, "linked" premises (or "co-premises"), where multiple claims together constitute a single reason supporting another claim. The Diagram was created using the bCisive software, which has the advantage of mapping the assumptions that support reasons.

Tim Van Gelder was a founder of AusThink and has developed some software that I particularly like for its use in asset management. It tends not to feature assumptions but lends itself to the creation of 'debates' (claims with supporting statements and objections) and 'discussions' (where the supporting statements and objections themselves are supported or objected to - with evidence).

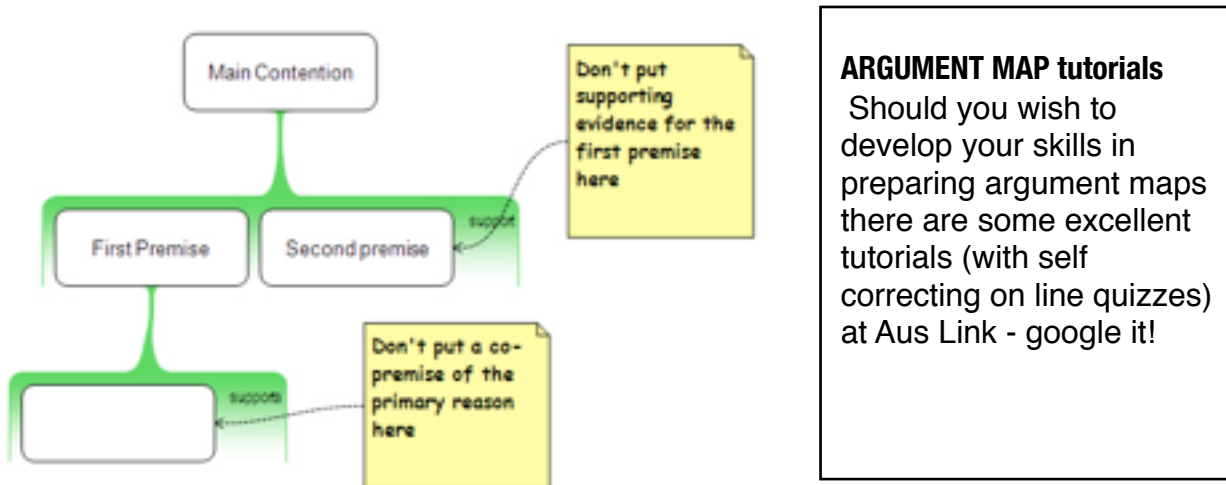
It is the 'with evidence' that is so useful for us as strategic asset management moves closer to its ultimate goal of 'evidence based decision making'.

"Developing good-quality argument maps in complex, murky territory is a challenging business. It involves getting sufficient clarity about what the issues are, and what arguments you have, and how they "hang together," to be able to represent those issues and arguments in diagrams following the rules of argument mapping - which are really just fundamental principles of good logical thinking. It is inevitably an iterative process, with each draft resolving some matters but opening others for exploration." Tim Van Gelder

Argument Maps:



Very complex arguments can go many layers deep. But be careful! Keep your premises and the evidential support you provide for them separate. *(your premise may be correct even if there is a challenge to the supporting evidence and you need to provide alternative facts to support your case)*



ARGUMENT MAP tutorials

Should you wish to develop your skills in preparing argument maps there are some excellent tutorials (with self correcting on line quizzes) at Aus Link - google it!

Advantages of using Argument Maps:

1. Articulate the arguments with as much clarity and rigour as possible
2. With the help of a broad selection of domain experts, in a series of workshops, identify strengths and weaknesses, including
 - Gaps – places where key arguments are missing, or more substantiation is needed;
 - Assumptions – especially “hidden” assumptions, i.e. ones you haven’t realised you’ve been making;
 - Objections and challenges
3. Use the findings to guide further development of the thinking

Let us put this into practice

In developing Adam Lucas' Ockham's Razor (May 2010) presentation as an argument map, I have chosen to position it as a collection of 6 contentions, namely Contrary to arguments by nuclear energy proponents, (1) nuclear is not increasing in importance, but rather is declining ('current status'); (2) neither will nuclear energy grow in importance in future years ('availability'); (3) it is not reliable because of insufficient fuel resources ('reliability'); (4) it is not cheap 'cost effective') and (5) it is not good for the environment (environmentally beneficial)' and (6) it is not safe ('safety').

You can re-order these contentions (current status, availability, reliability, cost-effectiveness, environmentally beneficial, and safety) to suit your own subjects but most, if not all, will be required for a good asset management argument, pro or con any given proposition.

An example: Nuclear Energy

(based on a presentation by Adam Lucas, University of Wollongong, to the ABC's Ockham's Razor)

Look at the Logic and Look for the Gaps.

Whether you are pro or con expansion of nuclear energy, find the points where other arguments can be inserted (in support or in objections to any of the statements here made),

Adam Lucas' Presentation:

"Calls for a public debate about nuclear energy as part of the solution to global warming have been gaining regular coverage in the international media for the last several years. A number of politicians, business leaders and scientists tell us that the world is experiencing a 'nuclear renaissance' which none of us can afford to ignore.

Proponents of nuclear argue that the grounds for scepticism about nuclear energy are no longer valid, and that technological improvements in recent years make it a viable and even a desirable option for new electricity generating capacity.

So what is the status of nuclear energy in the world at the moment? Do the arguments of its proponents stand up to scrutiny?

Nuclear energy is currently responsible for generating around 14% of the world's electricity. And although nuclear contributes anything from 2% to 6% of the world's total energy needs, it has been steadily losing out to renewables over the last decade or so, which now contribute between 7% and 20% of total global energy.

Just under 70% of the world's nuclear energy comes from five countries: the US, France, Japan, Russia and Germany. Almost half of the world's nuclear energy is generated by just two countries, the US and France.

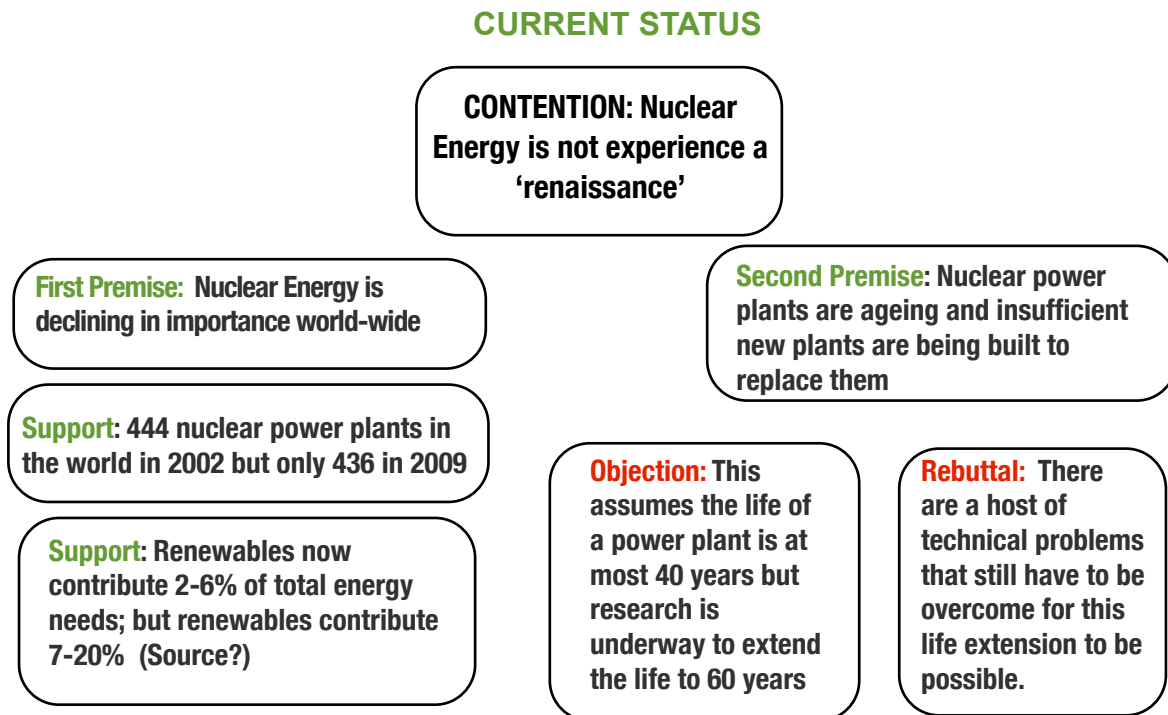
In December, 2009, there were 436 nuclear power plants operating around the world in 31 different countries: eight less than in 2002. And the world's reactor fleet is getting old: more than three-quarters of these plants have been operating for more than 20 years, and a quarter of them for more than 30.

Because the operating life of a nuclear power plant is at best 40 years, three-quarters of all the plants running now will need to be replaced by 2030 just to maintain their current generating capacity. That means 200 new plants within 20 years. And although there is

talk of extending reactor lifetimes to 60 years, there are a host of technical problems that would have to be overcome to make that a reality.

But the fact is that nowhere near that a number of reactors are actually being built, and it's very unlikely that they ever will be."

Let's stop here and summarise the argument so far in an argument map. Note that Argument Maps are inherently 'evidence based' - the evidence is supplied in the 'support' statements.



Questions: As well as references to sources for the facts used, what other supporting statements or objections might you want to add here?

Now Adam goes on to argue that not only is there not a nuclear renaissance now, there will not be one in the future. This is a statement about likely availability

"In December 2009, there were only 56 nuclear power plants being built around the world, and one quarter of them have been under construction for more than 20 years. Forty of these plants are in China, Russia, India and South Korea, and none of those countries are transparent about construction costs or schedules.

In the US, the American Nuclear Energy Institute has plans to expand the capacity of existing power plants by 10,000 megawatts, and to build 50,000 megawatts of new generating capacity by 2020. That means 40 to 50 new reactors across the US. But the industry also admits it would have to construct 35 new plants by 2030, just to maintain nuclear's current share of around 20% of total US electricity production.

As of March 2010, there were 18 applications for new nuclear power plants in the U S, eight less than a year ago. In February, President Obama announced \$US8.3 billion in federal funds to underwrite the cost of building two new megawatts reactors in Georgia, out of a total projected cost of around \$14 billion. But regulatory issues, community

opposition and a lack of private sector financing, means that it's not at all clear that any of the plants will actually be built. It's therefore not only unlikely that the industry's plans of expanded nuclear capacity in the US will be realised, it's not likely to even maintain its current share of total generating capacity over the next two decades."

FUTURE GROWTH

CONTENTION: - It will not be possible to build the number of nuclear power plants necessary for a 'nuclear energy

First Premise: USA.Planned expansion of existing plant by 10,000 Megawatts plus 50.000 Megawatts of new generating capacity by 2020 not possible

Second Premise: Sufficient worldwide expansion also not possible

Support: Regulatory issues, community opposition and lack of private sector funding means it is not clear that any of the plants will actually be built

Support: there are only 56 power plants being built and one quarter have been under construction for 20 years. (Assumption: they won't get finished?)

Support: Applications for new power plants are falling and are insufficient (at 18) to meet the demand for 40-50 new reactors required plus be on track for the replacement of 35 by 2030.

Questions you might want to ask: What are the assumptions underlying each of these statements (e.g. what does it assume about the life and current age of nuclear plants?) What objections can you think of?

Adam continues, looking now at a range of issues from future fuel availability, environmental impact, and risk and reliability. We will use the Argument Map to disentangle these different threads. We will deal first with Risk and Reliability, that is the likelihood of there being sufficient fuel available over the life time of the plant, assuming it is possible to expand it to the degree required.

"But let's assume for a moment that the industry's optimistic forecasts are achievable. How much of a reduction in carbon emissions would result, and how would it impact on the world's high-grade uranium reserves?

Doubling the current nuclear capacity across the world by 2035 would mean building more than 600 new plants, but would only result in a 6.5% reduction in CO2 emissions on 1990 rates by that date. Tripling the current worldwide capacity by 2050 means building more than a thousand new plants, and would only reduce atmospheric CO2 loads by 12% to 20% on 1990 levels.

Current estimates are that there is only 40 to 70 years of high-grade uranium left to be mined at current consumption rates. If consumption was tripled, the high-grade uranium would run out within 13 to 23 years. If all of the world's electricity demand were converted to nuclear, almost 3,000 new plants would have to be built worldwide by 2030, just to maintain today's

electricity generating capacity. That means the high-grade uranium would run out in anything from three to twelve years.

The three main arguments that proponents of nuclear energy have been using in recent years to promote its future expansion are that nuclear is reliable and relatively cheap, compared to most renewable energy, and that it's safe and produces far fewer greenhouse gas emissions than fossil fuel-based energy.

So let's examine each of these claims in turn.

France is often held up as a model for nuclear energy development, as almost 80% of its electricity is generated from 59 nuclear power plants. But the reliability of its large-scale nuclear program has come under pressure from climate change. In the summer of 2003, French nuclear plants were unable to operate at design capacity due to a lack of cooling water, which contributed to major blackouts in continental Europe.

To provide some idea of the water requirements of a nuclear reactor, the US Department of Energy recently published estimates of between 780 and 1,340 gigalitres of water per annum for a 1,000 megawatt plant. To put that in some perspective, the Greater Sydney region uses about 650 gigalitres of water per annum.

Furthermore, siting nuclear plants near water sources makes them vulnerable to flooding and storm surges due to climate change, as well as water scarcity due to drought. When the world's water resources are under threat from population growth and climate change, the wisdom of retaining any energy source that relies heavily on water for production has got to be seriously questioned."

There are a number of threads here: namely **environmental effects** - benefits of lower CO2 loads, but problems of establishing heavy dependence on water resources; **reliability** - risks of not being able to operate at full capacity; **operating costs**. It is common for many threads to be interweaved in an oral or written presentation. Argument maps can be used for greater clarity by disentangling the threads:

ENVIRONMENTAL BENEFITS

CONTENTION:
**Nuclear is not the environmental saviour
it is claimed to be**

First Premise: Environmental benefits from CO2 reduction are small

Second Premise: Excessive water demands presents environmental danger

Support: Tripling the current worldwide capacity by 2050 means building more than a thousand new plants, and would only reduce atmospheric CO2 loads by 12% to 20% on 1990 levels.

Support: between 780 and 1,340 gigalitres of water per annum are needed for a 1,000 megawatt plant - c.f. Greater Sydney region uses about 650 gigalitres of water per annum.

Questions: What other facts and/or arguments would you produce to support or object to the contention? Do you object to the evidence here produced?

RELIABILITY

CONTENTION: Nuclear Power is not as reliable as claimed to be

First Premise - likely future water scarcity could threaten reliability

Support: In the summer of 2003, French nuclear plants were unable to operate at design capacity due to a lack of cooling water, which contributed to major blackouts in continental Europe.

Second premise: siting nuclear plants near water sources makes them vulnerable to flooding and storm surges due to climate change, as well as water scarcity due to drought.

Note: Second premise does not have supporting evidence, it is only opinion at this stage.

Let us defer mapping Adam's cost effectiveness arguments as he has more to say on this matter below:

COST EFFECTIVENESS

Adam now looks at the claim that nuclear energy is relatively cheap (*I have signposted the different costs that he examines*)

Construction Costs

"Let's now examine the claim that nuclear energy is relatively cheap. Despite having benefited from hundreds of billions of dollars in investment and R&D over the last 50 years, nuclear energy has never lived up to the optimistic forecasts of profitability touted by the industry, and almost invariably experiences construction over-runs and cost blow-outs for both construction and operation.

The Shoreham nuclear power plant in the US is emblematic of the kinds of problems that can occur. The plant was estimated in 1966 to cost \$US65 million to \$US75 million, but ended up costing US\$5.8 billion by 1987, more than an 8,000% cost blow-out. It was closed by protests in 1989 without generating any commercial electricity.

Even with improved technology and economies of scale with multiple plants being constructed in the one country, a new 1,000 megawatt nuclear plant can cost anything from \$US6 billion to US\$10 billion, and has a six to twelve year lead time before it can start producing power. A massive new reactor currently under construction in Finland is now almost 60% over budget and three years behind schedule for completion, after only three and a half years of construction. The same new reactor design currently under construction in France is also behind schedule and over budget.

Operating Costs

Current low estimates of the kilowatt hour costs of nuclear, currently circulating in the US and UK, are based on the heroic assumption that the costs of construction and of uranium

ore will remain stable over the six to 12 years it takes to build them, as well as the 30 to 40 year operating life of the plant. And as I've already noted limited supplies of uranium and construction over-runs almost guarantee much higher costs than the industry is prepared to admit.

Reprocessing of spent nuclear fuel

Reprocessing of spent nuclear fuel was also supposed to be a big money earner for the industry, but the collapse of demand for plutonium in nuclear weapons and the failure of fast-breeder reactor technology have all but sunk the market for reprocessing.

The THORP reprocessing plant in the UK went into operation in August 1997, and was touted to make profits for British Nuclear Fuels Limited, of 500 million pounds. But a huge leak from the plant of 22 tons of uranium and 200 kilograms of plutonium forced its closure in 2005, leading to company losses of 1 billion pounds. A recent leak detected in May 2009 may lead to permanent closure of the plant.

Decommissioning Costs

Decommissioning nuclear power plants and remediating the sites on which they're located, has also proven to be extremely expensive. In the UK, decommissioning of the Sellafield power plant is expected to cost the UK taxpayer 1.5 billion pounds per annum for at least another ten years. The UK government has committed 73 billion pounds to cleaning up its nuclear legacy, a figure which has risen steadily in recent years.

The much-touted Yucca Mountain facility in the US has been effectively cancelled after serious questions were raised about the site's long-term geological stability and huge cost over-runs. Although the Obama administration has ruled that the site can no longer serve as a nuclear waste repository and substantially cut its funding, lawyers for the US Department of Energy are still attempting to win a licence application to continue construction.

Subsidy Costs

While industry proponents continue to attempt to persuade the public that a 'nuclear renaissance' is underway, the fact remains that it's taxpayers who provide the capital for any cost over-runs, accidents or problems, rather than the companies building and operating nuclear power plants and other nuclear facilities. It continues to require billions of dollars in government subsidies and unlimited levels of indemnity to attract private sector investment. By any rational assessment, nuclear is a poor investment. And even nuclear power plant constructors like Sandia in the US, are putting their own money into concentrated solar thermal with salt storage: baseload renewable energy, not into nuclear.

Environmental Costs

A relatively new argument that's being used to promote nuclear energy is that it can help reduce CO2 emissions.

The most recent comprehensive study of CO2 emissions from nuclear power plants using high-grade uranium found that various reactor types generate only one-sixth of the CO2 produced by a gas-fired power plant when a total lifecycle analysis is undertaken. However, it takes seven to ten years of operation before they achieve net CO2 reductions, compared to two to three years for wind power, and around the same for concentrated solar thermal power using parabolic troughs. More importantly, once the far more common low-grade uranium ores start being used as fuel, the CO2 generated by mining, milling, enrichment and power plant construction, adds up to more than that of an equivalent gas-fired power station.

I will leave it to you to try your hand at sorting out the premises and supporting evidence provided for each one under the cost effectiveness heading as this is the area where you will have most need to practice your skills in asset management proposals. You can use the signposting to determine the premises.

Finally he looks at the argument that nuclear energy is safe.

Let's now look at the argument that nuclear energy is very safe. While it's true that the safety record of the nuclear industry has improved in recent years, and that new reactor designs are far safer than the old ones, a single major accident can have catastrophic consequences, as was the case with the Chernobyl nuclear disaster in 1986; an accident which the industry continues to attempt to minimise.

The safety of nuclear energy should also be considered with respect to the prospects of nuclear terrorism, and the use of uranium and plutonium in nuclear weapons, artillery shells and 'dirty bombs'.

The more uranium that's mined and processed, and the more plutonium that's produced as waste from nuclear power plants, the more of a security risk is posed by that material.

Contrary to what the proponents of nuclear energy keep telling us, nuclear power isn't clean. It isn't cheap. It isn't secure and there's still no safe way to deal with nuclear waste.

By continuing to promote the fiction that massive nuclear power production is a viable alternative to the use of the fossil fuels and competitive with renewable energy, governments and industries around the world are wasting precious time that can and should be used to build and promote economically and ecologically sustainable energy solutions.”

SAFETY

CONTENTION; Nuclear Power presents serious safety issues

Second Premise: proliferation of nuclear energy increases risks of terrorism

First Premise: new reactors may be safer but there are still major risks

Questions: Supporting evidence? What else?(Adam's presentation on Ockham's Razor predates the Japanese tsunami, you may want to add the consequences of that to his arguments)

NOTE: All of these maps were prepared without the assistance of dedicated software, but having done it that way I would advise the purchase of some simple, dedicated, software that will greatly speed up and ease your preparations - and make it more fun! See the AusThink website for suggestions. austhink.com/ or rationale.austhink.com/