

Inquiry Name: Inquiry into Nuclear Prohibition

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Nuclear energy undoubtedly offers a technically viable pathway to a global low carbon economy, but the path towards implementation is by no means straight forward, particularly from the public perception angle. The track record of the nuclear industry is undoubtedly very, very good, but the industry has by no means solved all the potential technical and human based problems and risks.

As such, the removal of nuclear prohibition is a complex issue, and needs to be treated as such.

As an emerging energy technology research and developer, what I can perhaps best offer this inquiry is an insight into new and emerging nuclear technologies. Australia does not currently have a significant presence in this sector, but it clearly may offer a very viable near term pathway to a low carbon global future. To understand this sector, you need to understand some of the technologies.

Perhaps the most exciting new technology in this sector that should be of great interest to this enquiry is:

- Proton annihilation reactions. These systems release approx. 50x more energy than fusion and 300-400x more than the theoretical maximum of fission (noting that most practical fission systems operate at less 10% of the theoretical maximum). These systems have now been practically demonstrated and independently verified. The potential impact of these systems on the global energy (and potentially military) sector/s is undoubtedly absolutely huge. Any nuclear policy needs to position Victoria and Australia to be able to make best use of this process as it matures towards commercial applications.

There are also a number of other emerging energy technologies with significant disruption potential including:

- low energy nuclear. Over a 1,000 published papers have demonstrated nuclear reactions under relatively benign conditions. To date, these systems have been successful in the production of rare elements, but less successful in energy generation.

- highly controllable fission/fusion hybrid systems. These systems have been practically demonstrated and have the advantage of being completely controllable, so are not subject to "run away" problems as traditional nuclear systems are. These systems are well suited to strategic transport applications, such as submarines. Systems are currently being developed in the USA for this purpose.

- super chemical reactions. Whilst not actually being strictly nuclear, these systems offer very high energy density outputs, with energy densities mid way between chemical and nuclear reactions. These systems offer potential solutions for high energy transportation applications such as commercial shipping and aviation. At present prototype systems are practically producing (outputting) around 10x energy in (input). The market for these technologies is undoubtedly huge.

- Active nuclear waste "deactivation" technologies. It is now very possible to transition radioactive isotopes into

non-radioactive isotopes. This technology offers a potentially viable solutions to the 100,000 year radioactive waste problem of traditional uranium based nuclear systems, so may make nuclear technologies far more acceptable to the general public.

- More conventional generation IV+ systems such as Integral Fast Breeder Reactors, advance molten salt systems, thorium reactors, etc. Each of these systems has their pros and cons.

As you can see from the technologies listed above, there are many and diverse technologies that fall under the "nuclear" banner. A suitable policy should consider the complexity of existing and potential future offerings, in terms of both risk and opportunities in this space. Policy should:

- have a quite detailed approach, rather than a "blanket" approach to nuclear technologies,
- recognise a nuclear based global low carbon future as a very realistic pathway, and seek to identify ways which Victoria can enter and become an active technology provider in this space, noting that this may be our best way to facilitate a low carbon global future,
- seek to develop education platforms that can feed into a nuclear based low carbon nuclear future,
- set up a special task force to review and stay informed of emerging energy technologies, and to identify and enact opportunities,
- look to re-establish "moral authority" as global leader in climate change solutions by becoming an active information contributor, facilitator and promotor in the emerging energy technology space, through active involvement by government agencies, education providers (universities, schools, TAFE) and information providers (Museums, etc.).

Victoria can be a REAL contributor towards a better global climate future by becoming an active player and contributor in the emerging energy technology space. There are some real challenges to entry into this space, particularly the theoretical and academic sectors which remains at least 40+ years behind current lead edge developers in this space. Very, very few understand the current state of play in the emerging energy technology sector. As such, "up-skilling" Victorians to be able to contribute and prosper from new directions in this field is a big challenge. As a start strong competent leadership is needed, something that there may be very few candidates for. Getting the right people into the right places to lead the process is essential. (Happy to assist!!!)

The community is starting to become more aware of the urgency of the climate change challenge, but very few are aware of the biggest 'elephant in the room' - "lag". "Lag" means that temperatures will keep increasing even if we stop carbon emissions today, due to both geological/ocean/ice lag (things heat up slowly) and sulphate emission lag (the cooling effect of sulphate particles emitting from coal fired generators), meaning that we are already locked in to temperature increases of close to 2 degrees celsius above pre-industrial, even if we were able to immediately switch to low carbon energy. In this context, we do need to be rapidly transitioning to a low carbon future, and potentially a nuclear based low carbon future. This is not just to lower Victoria's emissions, but globally, so becoming an active player in the development of new nuclear technologies is a huge opportunity to make a REAL difference to global climate futures.

With hope, Simon Brink,

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