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## Moving the World

Science and leadership before and after Copenhagen

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Check against delivery

- Good Afternoon distinguished colleagues.
- Let me begin by first thanking the CEO of VECCI, Mr. Wayne Kayler-Thomson for his wonderful introduction and presentation here today. VECCI provides an excellent range of support services to its 15,000 members in Victoria and it is through their kind generosity and sponsorship that we have been able to enjoy this fine luncheon.
- Of course today would not have been possible without the work of Michael Roux, Chairman of the Australian Davos Connection. He and his colleagues have spent many hours working tirelessly to bring this event together and invited such a prestigious and diverse audience.
- Thank you for coming. It is truly wonderful to see how much interest we have generated here today on this critically important issue, an issue nothing short of Moving the World.
- [Slide] Archimedes, one of the great ancient Greek natural philosophers of all time is reported to have said. "Give me a lever long enough and a fulcrum on which to place it, and I shall move the world."
- He was describing the basic physical principle that a small force on a long lever can have a large effect if the base, or fulcrum, on which the lever rests is solid.

- Next week political leaders from around the world will meet in Copenhagen to attempt to reach an agreement about climate change.
- An agreement that has the potential to begin an effective and collective fight to mitigate against further climate change and help communities around the world adapt to the changes already underway.
- It is a meeting with the potential of moving the world. The science and public opinion upon which they are resting their level is strong.
- But I imagine that regardless of the outcome of the Copenhagen meetings, there will be those who hail it as a success and those who describe it as a failure.
- Either way, two things are certain.
- First, the scientific truths that set us on this common journey are tolling more loudly and more clearly than ever the need to take immediate action.
- Second, an incredible amount of work will still remain to be done, most of it outside the realm of politics. Of course having a supportive policy framework would help, but forward-looking sectors

cannot afford to wait for this to be in place before they act.

- Today then, I'd like to talk about ways in which the world is changing and ways in which it could change, regardless of the outcome at Copenhagen. And about how these depend on science and on leadership.
- Science is at the base of this issue, so it is important to review what science tells us about the extent and speed of climate change.
- The sun continuously bathes the Earth with energy in the form of sunlight. Much of this energy is absorbed by the Earth, and then emitted as infrared radiation, or heat. Greenhouse gases prevent the Earth from discarding as much of this heat as it otherwise would back into space.
- This process has long been understood. Its basic physics is measured in the laboratory and its affects are observed on Venus as well as Earth.
- Due to the quantity in which it is emitted by humans, its longevity in the atmosphere, and its effectiveness in trapping heat, carbon dioxide, CO<sub>2</sub>, is the most important of the greenhouse gases currently causing changes in the Earth's climate.

- [Slide] Oceans soak up 85% of the heat trapped by increased greenhouse gases. Their average temperatures have been steadily rising since at least 1959.
- Only a small fraction of the additional heat is taken up by the atmosphere. As a consequence, air temperatures are quite susceptible to the state of the ocean and land beneath them.
- For example, temperatures fluctuate more with night and day, more with winter and summer, and more with the direction and strength of the wind.
- That is why we see air temperatures affected by changes in ocean currents, the most famous of which are El Niño and La Niña, though another, the Indian Ocean Dipole, is also important to Australian local climate.
- During an El Niño, when more warm water is brought to the surface to exchange heat with the atmosphere, most of the world, including Australia, experiences hotter temperatures, as illustrated here.
- Opposite trends are seen during La Niña years.
- Despite having just emerged from the cooler La Niña, globally 2008 was the tenth warmest year

since records started in 1850, and 2009 is shaping up to be warmer than 2008.

- [Slide] Sea level is rising, partly because warm water expands and partly because glaciers and land ice are melting and calving off in large pieces into the sea.
- At the moment, average sea level rise is about 3 mm per year, and projections for the end of the century range from 75 to 190 cm (nearly 2 meters) depending on the movement of the great ice sheets.
- Changes are occurring not only in the long-term average values of temperature, precipitation and wind speed, but also in the intensity and frequency of extreme weather events.
- This is why in Australia we can expect to see more severe droughts, more frequent violent storms and a higher number of extreme fire danger days.
- [Slide] Many climate indicators are moving faster than had earlier been anticipated, in part because the world is emitting greenhouse gases at an even faster rate than the “worst case” scenario considered by the Intergovernmental Panel on Climate Change (IPCC) in its 2007 report.

- The greenhouse gases that we continue to emit each year commit us to increased future global temperatures for many decades, even centuries to come.
- We are now 0.8 degree Celsius above global pre-industrial temperatures due to greenhouse gases that we emitted last year, ten years ago and fifty years ago. When the full effect of those additional gases in the air is felt, the global temperature will be another one-half degree higher still.
- In other words, even if everyone on the face of the Earth stops emitting greenhouse gases tomorrow, we have already committed ourselves to a future in which the global average temperature will be 1.3 degrees higher than the periods in which modern civilization has flourished.
- Given current emissions trajectories, it is almost certain that we are locked into a climate that will be 2 degrees higher.
- Scientists from a variety of disciplines in nearly every major country in the world have been studying the effects of climate change on sea level rise and built infrastructure, on the capacity of the earth to produce food, on the health of ecosystems, and the extremes in weather.

- They have concluded that temperature rises more than 2 degrees will result in a world that will be difficult, dangerous and divisive.
- [Slide] What would a world and its climate be like if we surpass what is called the “2 degree guardrail?”
- In many categories such as risk to wildlife, extreme weather events and the distribution and magnitude of economic distress, we are already facing risks (shown in yellow) with a 2 degree world. But going above 2 degrees places all of the risks in the red.
- What must change to ensure that we stay within the 2 degree guardrail? Fundamentally, we cannot overspend the 2-degree carbon budget. This is the net amount of carbon generated by human activities that could be emitted without generating warming above 2 degrees.
- Our total global budget for the period between 2000 and 2050 is round about 1000 Gigatonnes of carbon in total. For the whole world, for the whole fifty years.
- If we spend (emit) more than that, the probability that we will exceed the 2 degree guardrail temperature grows.

- The more we overspend, the higher the probability of temperature rises much higher still.
- Unfortunately, we've already spent about one-third of the budget and we are only 10 years into the 50-year period.
- There are no loans, no bailouts, no one to print currency to enlarge the carbon budget of the atmosphere.
- Nature has already assisted by absorbing about half of our carbon dioxide emissions into the oceans and land sinks, but that capacity is being eroded by weakening oceans and continued deforestation.
- [Slide] Shown here are three trajectories that would give the world a 75% chance to remain in a 2 degree warmer climate.
- Roughly speaking, the area underneath the curve is the total carbon budget. Note that the more of our carbon budget we spend now, the less we will have to spend later, and the faster we will be required to curtail future spending.
- While there is no single magic date for action, every day that we do not act is a day that compounds our problem into the future.

- By acting now to ensure that annual global emissions peak by 2015 and then fall steadily every year thereafter, we can transition into the new carbon economy in a planned and measured way, and be rewarded by leading, rather than trailing the pack.
- The measures available to us to begin to turn this emissions curve around are known to everyone.
- These include wind energy, better emission standards for cars, and making our buildings, transport and appliances more energy efficient.
- At the same time, we need to massively increase our investment in the research and innovation required to continue the transition to a low-carbon environment, including investing in smart, power grids suitable for the distribution of renewable as well as other forms of energy.
- This is a win-win situation, increasing the chances of a more hospitable climate in the future, and developing more competitive industries in a world market that is already turning, albeit slowly, to low-carbon alternatives.
- If we wait until 2020 to turn the annual emissions curve over, we will need to either clip global

emissions by a whopping 9% per year, or prepare ourselves for a considerably more difficult, dangerous and divisive world.

- Discussions in Copenhagen will not alter our global carbon budget. That budget is set by the biology, chemistry and physics of the Earth's land, oceans and atmosphere.
- What Copenhagen *could* do is begin to take the concrete steps that are most needed if we are to travel a trajectory compatible with a 2 degree world by (a) assisting the most vulnerable in the world to adapt to it, and (b) fast-tracking the technology, research and social innovations required to achieve it.
- [Slide] If Australia were further from the equator, we might celebrate ice hockey as a national sport. One of ice hockey's premier athletes is Wayne Gretzky of Canada.
- It is said that part of Gretzky's success was due to the advice of his father to "Skate to where the puck's going, not where it's been".
- There are changes ahead, and we need leaders in all communities, in all sectors, than can skate to where the puck is going.

- There are at least three ways to skate to a 2-degree world:
  - Decrease actions that put the world at risk of any higher temperatures and increase investment in new low-carbon infrastructure (mitigation)
  - Climate proof our communities, industries, and social systems against the climate change that is already locked in (adaptation)
  - Grasp the opportunities that will accrue to those that have the vision to see what can be done when they arrive at the puck in the emerging low-carbon world (innovation)
- I'd like to share with you some of what others around the world are doing to give you a sense that this is not a static situation, but rather one in which true leaders and innovators at national, sectoral, community and individual levels will see opportunity.
- Over the past thirty years, Denmark has gone from being fully dependent on external energy to becoming a net energy exporter. Its GDP has grown by 70% over this period with almost NO increase in its total energy use. The same time, its CO2 emissions have dropped by 18%.
- [Slide] MidAmerican Energy Holdings, a subsidiary of Warren Buffett's Berkshire Hathaway, delivers

energy to 6.9 million customers in the United States, a country, like Australia, that is rich in coal.

- In the years from 2000 to 2008, MidAmerican grew its total energy portfolio by 30%, while decreasing its energy intensity by 8%.
- It did this by growing the fraction of its energy portfolio in renewable and non-carbon energy sources, which now account for 24% of energy generation. Nearly 20% of their total portfolio is already renewable.
- By sometime in 2010, MidAmerican expects to use coal to produce 40% of its electricity. In 2000, that fraction was 70%.
- The company has also reached a definitive agreement to purchase a 10% interest in BYD, a high-tech company headquartered in China.
- China is another interesting example. BYD, for example, employs nearly 8,000 engineers and scientists, working on new battery developments, solar power and electric vehicles.
- China is now the world's largest producer of wind turbines, and its rapid growth into solar energy technologies is legendary. Clearly, China sees a future in the emerging low-carbon economy.

- Leadership is being exhibited at all levels around the world, including by jurisdictions and communities considerably smaller than that of entire nations.
- California increased its solar and wind energy capacity by nearly a factor of five between 2007 and 2008 alone, for a total of 516 Megawatts.
- A total of 944 cities in the United States have individually indicated that they support the Kyoto protocol, and many developing plans to monitor and restrict their own emissions. They are not waiting for Copenhagen.
- In 2007, the US city of Denver released a greenhouse gas inventory for the city, with targets that include eliminating the need for one coal plant by 2012. By 2020 Denver plans to reduce emissions further still by an amount equivalent to two coal-fired plants.
- Indeed, Seattle believes it has met its target reduction in 2005, by reducing its greenhouse gas emissions by 8 percent since 1990.
- [Slide] Kenya is said to have the highest penetration rates of photovoltaic technology in the world. Small low-efficiency, but very affordable

solar cells are now installed at the rate of 30,000 new systems per year and the largest new form of electrification.

- What about costs? Studies presented by the Director of the Global Energy Assessment indicate that the cost to maintain the global temperature rise to 2 degree C is nearly the same as that to maintain the rise to 4 degree C. Why? Because much of the reduction in greenhouse gases can be achieved through energy efficiency, which saves energy and thus money.
- In fact, according to the World Energy Outlook for 2009 just released by the International Energy Agency, each year we delay action, the total cost of mitigation increases by \$500 Billion between now and 2030.
- So any way you look at it: scientifically, environmentally, and in order to ensure sustainable commercial health in the emerging low-carbon world, we need to act now to limit global warming and stay with the 2-degree guardrail.
- [Slide] How will we judge whether or not our actions are making a difference? By watching, year by year, the total concentration of greenhouse gases in the atmosphere, something scientists, including those at Cape Grim in Tasmania, can measure very well indeed.

- When the greenhouse gases stop climbing at such a rapid rate, then level off, and finally begin to decrease, we will know that we have begun the greatest transformation since the Industrial Age into a new era of sustainability.
- You know, I have heard it said that it doesn't matter what Australia does because its world emissions are too small to make a difference.
- As a nation, it is true that Australia's total emissions are just a small part of the globe's total greenhouse emissions.
- But due to our large individual carbon footprints, some of the largest in the world, we, as individual Australians, are probably more able on a person-to-person basis to effect change than any other individuals in the world.
- Australians matter and can make an enormous contribution.
- Why would we not rise to this challenge and this opportunity to move the world with Australian science and Australian individual and collective leadership?