This short inspiring story will focus on a potential future where the US has moved to a more sustainable economy, with the power of developing semiconductors in the US, and with the use of other technologies that speed up this process. This is a sci-fi prototype because I want to explore what the future would look like if the US and the rest of the world decided to put an effort toward a sustainable future. The target audience of this short story is customers, companies, their business partners or clients, government officials, and policymakers. I would want my target audience to invest in renewable energy technologies and advocate for policy changes that accelerate the transition away from fossil fuels and develop all of our semiconductors or "chips" here in the US, instead of relying on countries in Asia. This would help our economy tremendously.

From Fossil Fuels to Sustainable Technology: Alex Hallwing and his Journey Towards a Brighter Future

By Ilyas Saoud, CBS

Published 4:07 PM EDT, Fri 28, 2105

This weekend, I had the pleasure to sit down and speak with Alex Hallwing, the man who helped shape the sustainable world we live in. Alex and his father's humbling story have inspired many scientists around the world. This is the first time Mr. Hallwing agreed to sit down for a one-on-one interview. Here's how it went.

Ilyas: Mr. Hallwing, your fa…

Alex: Just "Alex" please.

Ilyas: Sure thing, Alex, your father built Groundhog Materials to address the need for rare earth elements in sustainable energy and create a positive impact. The company was, however, struggling to keep up with the demands. As a new graduate, what were your plans then, and could you discuss your father's experiences in the Eastern War, and what sort of impact did that have?

Alex: The rumor going around was that *Groundhog Materials* is hanging on by a string, and they were right; The company my father built from the ground up was failing, and all the fingers were pointed at me looking for answers. The year is 2055, I have just graduated with a master's degree in Machine Learning Engineering with a minor in business, and looking forward to working alongside my father to help the company grow and make a positive impact in sustainable energy. It was an interesting feeling at the time, I waited my whole life to graduate college, and I imagined how I'd feel, and what I would experience, but it just felt like another day, the arrival fallacy; Nonetheless, I was happy to be done. See, my father was a war veteran, and if you knew him, you'd know all the stories he wouldn't stop talking about. In 2025, he fought in the Eastern War. He and some of his college buddies were drafted during their sophomore year of college, and of his friends, my father was the only one who returned home with survival guilt, but he's a

hero in my eyes. He says he wasn't supposed to make it back, he signed up to be a medic at the base, but the next thing he knew, he was strapped to a falling helicopter, and yet survived the crash. Like many wars, the aftermath is always ugly. After the war, the relationship with China was fragile, and so the U.S. economy took a big hit due to our dependencies. In 2030, 5 years after the war which happens to be the year I was born, the US was battling climate change – like the rest of the world – and economic issues, and the semiconductors – also known as "chips" – were in high demand in all sectors. My father went on to finish his degree in Materials Engineering and started his own mining company called *Groundhog Materials* with a special zero-interest loan for veterans. The US was in large need of rare earth elements, which are vital to almost all modern technologies, and my father thought that if we want to battle climate change and get our country back on its feet, we will need to develop a large number of wind turbines and solar farms to build a sustainable future, which all rely on semiconductors. My father was 25 years old when he started the company, he told me stories, and how he had this burning desire to make the world a better place, what young man or woman that age thinks like that? Something must've clicked post-war that I can't relate to; I spent my college days with my roommates, arguing about who the best NBA shooter is – that is, of course, Stephen Curry.

Ilyas: Your post-graduate plans changed, you faced new challenges and took the company to a whole new level, what changed?

Alex: Well, after I graduated in 2055, my father gifted me a brand-new vehicle. This was perfect timing since my 2030 Hyundai was all banged up and old, the Hyundai's virtual assistant "Sam" would warn me about battery issues every 5 minutes, and not to mention the auto-driving system was nonexistent since the cameras and sensors had all sorts of malfunctions; I had to manually drive everywhere like old times. My new car was a cherry red 2055 Lotus SL, arguably the world's most efficient hydrogen sedan, with a range of 1000 miles! I still remember the brand-new car smell, the brown leather stitching, and the Augmented Reality (AR) glasses that came with it. I immediately drove to my friend Adam's house to show him my new car. We grew up loving muscle electric cars, his father had a classic 2025 all-electric Dodge Challenger with 750 horsepower, and I loved that car so much. The excitement and joy I had that day were short-lived. While driving back home, my AR glasses displayed an incoming call from my father's assistant Nichole, she never called me before, so I picked up the call just to hear silence for the first few seconds, *"Alex, your father had a car accident"* she finally said. I asked the AR's GPS to reroute the red arrows on the road to direct me to the Golden Bridge Hospital – the same hospital I was born in – just to be welcomed by a stupid robotic nurse assistant who, of course, cannot understand or feel the emotions I was going through that day, but they're sure are good at mimicking them to make you feel at ease. The shortage of management staffing in the healthcare system had forced the states to allow robots to run the floors for guidance, scheduling, and even speaking to patients about sensitive topics. Unfortunately, a few weeks later my father passed away due to his injuries. It took me months to recover from this loss, but I had to get back on my feet, back to the company, and continue my father's work. The company wasn't doing too well. The mining sites lacked the right resources to mine the rare earth elements, and so we lost employees and investors, and I found myself with over 300 men and women waiting for me to make the right calls. I wasn't ready, I had no experience in leadership, but I think I finally began

to feel that burning desire my father had. As I reflected on my father's legacy, I realized that his burning desire to make the world a better place had been passed down to me. I knew that my work at Groundhog Materials was just the beginning of my journey to help create a better future. At the time, the US and the rest of the world still relied on fossil fuels. The US accounted for about 12% of total US energy consumption of being from renewable energy, this is the same percentage we had back in 2020. The War reversed the positive trajectory the US was making toward renewable energy, and so the US and most other countries had to start all over again. But the struggle of Groundhog Materials to stay afloat and my determination to use my knowledge and skills to help turn the company around was a step towards a brighter and more sustainable future. With the right investments in technology and innovation, we knew that we could make significant progress toward renewable energy and reduce our dependence on other countries and fossil fuels.

Ilyas: As the new CEO, you had valuable skills in machine learning and artificial intelligence, what was project “GroundAI” like, and how did that start?

Alex: The Analytic team and I spent the next 10 months developing the project GroundAI – a model that can predict mining sites across the US that will put us at a higher chance of mining the right elements and the right amount we need to succeed. We collected millions of data and started to build statistical models –state-of-the-art AI algorithms – that can predict GPS coordinates where the rare earth elements are located. Success! This model had an accuracy of 85%, this was huge at the time. Our AI department grew dramatically ever since to develop future models and technologies that will assist us in transforming our new world. Some years after our success in mining rare earth elements, we decided to expand our vision, and so we began to build our semiconductors, solar panels, and wind turbines. We focused on expanding our wind turbine and solar farms towards the west and east coasts where electricity usage is at its

highest. We had everything going for us, we built drones with AI computer vision technology that automatically inspected all of our equipment, wind turbines, and solar panels for cracks and debris which led to lower downtime for maintenance. By 2080, Groundhog Materials and the US became world leaders in sustainability and technology. We made a real difference in the world; our inventions and company not only paved the way for a brighter and more sustainable future but also revolutionized the semiconductor industry. According to the University of Texas at Austin, our semiconductors were crucial in the development of future solar cells, batteries, and other clean energy technologies here in the US. I was happy that my father's hard work didn't go to waste, and this time, my arrival at this point was not an arrival fallacy.

Ilyas: Now, May 21, 2081, was a big day for you, and the company, what do you remember from that day?

Alex: I still remember that night, my daughter was heading back from college, and I was rushing back home to my wife to get ready for the nice dinner we had planned for the family, and as the vehicle parks itself, I received an email from SpaceX with a contract offer to allow us to build our mining site on mars which will help SpaceX collect special elements found in Mars such as silicon, oxygen, iron, magnesium, aluminum, calcium, and potassium. This was a huge deal at the time. SpaceX had already established multiple bases on Mars where most are run by robots for development. The first Martian Base "Doge City" held about 1000 Martian workers at the time and began to expand this base to hold over 10,000 people in the next 10 years. My team and I were very excited. We began to redesign our hardware and software to adapt to the Martian atmosphere, we ran hundreds of tests here on Earth to ensure that our mining technology was safe and ready to be deployed. I got to meet Elon Musk's son X AE A-XII Musk, we discussed the future and his vision for Mars, and he reminded me a lot of his father. I was happy to see

another visionary, who is dedicating his life and time to continue his father's legacy and do it with a smile. A year later, a fleet of Starships was ready to take their trip to Mars with our equipment fully loaded on the first stages, where each ship will take on a 6-month journey to Mars. SpaceX had the timing right as always; we can only go to Mars every 26 months because that is the period when Mars is closest to Earth and the most efficient time to launch a spacecraft to travel there. Watching the Starship take off and land never gets old. My family and I had the pleasure of joining the Musk family to watch the fleet of Starships blast off to space, this was a dream come true.

Ilyas: Such an inspiring story Alex. There were many speculations surrounding the idea of creating a Martian society. How did SpaceX handle that?

Alex: At the time, the Martian City had just begun implementing laws and regulations that will govern the future society there. The TIME magazine had just published the blueprint released by SpaceX where it discussed plans for Mars, from policies, and education, to a whole new government system that will be put in place. Education for future Martian children was also a key focus, with plans for a comprehensive educational system that would be tailored to the unique challenges and opportunities of living on Mars. This included not only traditional academic subjects but also practical skills and training. This included maintenance and repair of equipment and infrastructure, and safety. Today the government and educational system established by SpaceX has proven to be effective. There were many ethical challenges they had to overcome, but the Martians adapted to their new lives.

Ilyas: Now, looking back at all that you've accomplished, how do you feel?

Alex: Well, today, as we entered the 22nd century, I just look back and think of the journey I lived. I never thought I'd get this far, but that's life, it's a journey with ups and downs and twisted roads. It's now 2105, just yesterday I celebrated my 75th birthday, and today I had the pleasure to see my daughter on stage, giving her speech as she becomes *Groundhog Materials'*

new CEO. I couldn't help but feel so proud and emotional, knowing my father would've been so proud of what we'd accomplished here together for the last 50 years. The Martian Doge city has expanded to hold over 50,000 people now, with Starship fleets traveling back and forth with new citizens, workers, and cargo full of new equipment for expansion. The mining sites we built are still operating successfully to this day as we're expanding due to high demand, and helping SpaceX with special elements and technology that they need to continue their mission, and ours to terraform Mars and make it a safe habitat for all. As for the earth, 98 percent of the earth's energy consumption now comes from sustainable energy. Many companies who came after us had the same mission and vision from all over the world, and now more countries have joined the NATO alliance to protect our planet and ensure a peaceful future for all. The world has changed so much since I was a young man, and I've seen so much progress and growth in my lifetime. But there are still challenges we face as a society, and I know that my daughter and her generation will continue to work tirelessly to make the world a better place just like my father before me. I feel grateful to have been a part of this journey and to have played a small role in creating a brighter future for my daughter, my grandchildren, and for all life here on earth, and beyond.

Sources

Earth.org. (n.d.). The Role of Semiconductors in the Renewable Energy Transition. https://earth.org/semiconductors/

Intel. (2022, August 4). Intel Introduces First-of-its-Kind Semiconductor Co-Investment Program. https://www.intel.com/content/www/us/en/newsroom/news/financial-news-aug2022.html#gs.uh7c3v

President's Council of Advisors on Science and Technology. (2022, September). Report to The President Revitalizing the U.S. Semiconductor Ecosystem. https://www.whitehouse.gov/wpcontent/uploads/2022/09/PCAST_Semiconductors-Report_Sep2022.pdf

University of Texas at Austin. (2015). The Role of Semiconductors in Clean Energy. https://repositories.lib.utexas.edu/handle/2152/47379 MDPI. (2021). Augmented Reality in Industry 4.0 and Future Innovation Programs. https://www.mdpi.com/2227-7080/9/2/33