Executive Summary - The Low Carbon Value Chain - Fred Moesler

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Hosted by: Growth Arc Advisors LLC

Contact: Kendall Justiniano for follow-up consultations for your organization.

Summary

Just because it can be done technically doesn't mean that it's economically viable as a business.

If there were a tagline to the trajectory of Fred Moesler's career, it would have to be that. With a background in math modeling, process optimization and full-scale operations, Fred has honed a particular approach to evaluating new technology opportunities. It's one he refined over a career spent bringing new fermentation technologies to market. He started at Dow working on spinosad and then polylactic acid, which later was spun into Natureworks LLC, and then on to several cellulosics technology ventures, eventually landing at ligno-cellulosic startup Renmatix as CTO, and now Global Thermostat working on direct air CO2 capture systems.

Fred's perspective, that the number of technologies that show technical feasibility is vastly larger than the number of technologies that have commercial potential, and that therefore technology development requires a holistic and fairly ruthless approach. The pace of generation of new technology ideas is accelerating, and that is an exciting development. Given that development the capability to sift and develop candidates with an eye to commercial viability becomes even more critical. Not only do technologies need to be demonstrated, proven and scaled, but they should also be evaluated critically within a broader commercial and economic context, an approach that is not always used. This requires understanding competitive options, and their economics, as well as commercialization pathways and partner potential and designing a technology validation pathway appropriately. Moesler uses technical economic analysis, including methods like Monte Carlo analysis, to identify the most sensitive variables and establish key performance indicators (KPIs) and technology plans to address them in order of importance. However, he acknowledges that people often struggle with this level of analysis as it can be more complex than initially anticipated. Additionally, some individuals may be afraid of the answer and hesitant to face the reality of their potential shortcomings. Moesler highlights the importance of confronting these challenges in order to improve and make better decisions.

Venture Landscape

Fred discussed the different types of venture investments that play a role in materials. Traditional venture capital focuses on building the fundamentals of a technology and developing projects from early stages. Strategic venture capital, venture investing done by materials companies, on the other hand, looks for opportunities that align with their own value chains and can help bring the technology to market. This type of investment is especially valuable when the venture fits directly into the strategic pathway of the investor. However, in the materials industry, the speed to commercialization and the value that venture investments bring can be challenging. Compared to the tech industry where software and hardware technologies can be rapidly improved and commercialized, materials development takes longer and does not always offer the highest returns. Materials ventures find themselves in a middle zone where the time horizon is longer than desired and the value is not as explosive as in other industries.

Fred also mentioned four key areas in venture investing today: carbon capture, energy storage for renewables, alternative foods, and non-sugar feedstock platforms.

Carbon capture is currently a major investment area, with significant funding going into various forms of capturing carbon dioxide from both point sources and direct air capture. The drivers in carbon capture include tremendous investment in various forms of carbon capture technology, such as point source capture and direct air capture. There is a strong government driver for carbon sequestration, as well as a focus on using captured carbon to produce durable goods like concrete and fuels, particularly sustainable aviation fuel. Both large oil majors and pure ventures are investing heavily in these areas. However, there are several challenges in carbon capture. The technologies are difficult and not easy to make cost-effective. Efficiently capturing carbon and turning it into something valuable requires careful attention to the bottom line. Despite these challenges, Fred believes that carbon capture can be achieved and there are promising pathways for its success.

Energy storage for renewables, including battery technology and other forms of energy storage like heat storage, is another area attracting substantial investment. While the alternative foods sector may be slowing down, it still receives attention from venture capitalists, particularly in the early stages. Lastly, the exploration of non-sugar feedstock platforms, specifically lignocellulosic platforms, is an area that has faced challenges but which expects to make a comeback. These ventures can have a meaningful impact on fuel and material production, and there is interest from players who have stranded resources to extract value from. Additionally, governments may incentivize these ventures as they also possess stranded assets.

Technical - Commercial Viability Framework

Fred Moesler takes a systematic approach to determine the technical-commercial viability of a technology. He begins by screening for any hard fundamental barriers that the technology may violate, using principles such as stoichiometry and thermodynamics. This initial step helps rule out ideas that may not be feasible from the start. Once past this hurdle, Moesler emphasizes the importance of taking a holistic view of the value proposition and developing a process that can compete in the market space. This involves understanding customer needs, identifying competitors, and examining their limitations in supplying within the same space. Moesler highlights the potential risks of launching a product without thoroughly investigating the market economics, citing an example where competition quickly dropped prices and resulted in significant financial losses. Furthermore, he acknowledges that this evaluation process takes time and resources, which may be challenging for startups, but it is essential for success. In conclusion, Moesler's approach includes screening for barriers, considering the value proposition, understanding customers and competitors, and planning technological development accordingly.

From Fred Moesler's perspective, there are psychological challenges entrepreneurs face in facing technical-commercial viability questions on a technology. Fred believes that pitching a compelling story can sometimes blind entrepreneurs and investors to the reality of their situation, leading them to avoid asking crucial questions. He acknowledges that good due diligence is sophisticated, and it can be frustrating to watch projects that lack basic feasibility receive funding. Ultimately, this is illusory, as good entrepreneurs know that funding from uninformed investors doesn't help in the long run. Fred emphasizes the importance of being honest and transparent with both oneself and investors, presenting realistic plans and demonstrating how the allocated funds will drive the project's progress. In his experience, savvy investors are more likely to support ventures that have a clear and grounded direction rather than those based solely on visionary ideas. He also believes that there are ways to overcome challenges that arise in good due diligence by adjusting the approach, such as changing the target market or process.

Fred's approach to technology development is characterized by a combination of product creation and continuous development and piloting. In the early phases, Fred focuses on simultaneously proving product technical feasibility, and establishing the value proposition of the product while learning about the marketplace. This information is then used to secure further funding and build a team. As the technology becomes better understood, Fred begins to shift towards commercial development and explores ways to bring the product to market. The amount of time and effort invested in each stage depends on various factors such as cost, quality, and potential advantages. Fred's approach is dynamic and adaptable, aiming to strike a balance between innovation and commercialization.

Outlook on Various Sectors

Fred discussed his outlook for several sectors.

Carbon Dioxide Capture

Fred has a positive outlook on the carbon capture sector, particularly on the potential for direct air capture technology. He believes that there is a growing interest in finding innovative ways to utilize captured carbon, such as in the food and beverage industry. Fred also highlights the current supply chain issues in the merchant CO_2 market, where costs can vary significantly depending on shipping locations. He sees an opportunity for direct air capture plants to be located closer to the consumers, thereby eliminating supply chain problems. Fred believes there is a demand for simplified and portable technologies like direct air capture. He emphasizes that this approach can solve early problems and reduce costs, allowing for further technological advancements and price reductions in the future.

Hydrocarbons from Carbon Capture + Green Hydrogen

Fred's outlook on the use of carbon capture combined with green hydrogen to make hydrocarbons is optimistic but cautious. He acknowledges that there is a lot of interest and investment in the field of e-fuels, driven primarily by European companies and the EU, and transportation companies that hope that electrifying fleets is partially accomplished with e-fuels, but also acknowledges the need for competitive prices in order to be viable. He emphasizes the challenges associated with and the importance of driving down costs, particularly in relation to hydrogen prices. Fred also highlights the potential of small modular nuclear reactors for renewable energy and the need for reliability low-cost renewable electricity to make the soltuion viable. Sustainable electricity sources, such as wind and solar, cannot provide that input at scale. Fred sees sustainable aviation fuel as a lead example of the push for e-fuels, given the difficulties in decarbonizing the airline industry and the desire for alternative aviation fuels. He notes that both airlines and aircraft manufacturers are pushing for engines that can burn these fuels and are even considering producing the fuels themselves. Overall, Fred sees potential in the use of carbon capture and green hydrogen, but acknowledges the challenges and the need for further development and cost reduction.

Chemical recycling of Plastics

Fred's outlook on the chemical recycling of the plastics sector is one that acknowledges the challenges and complexities involved in the process. He raises questions about plastic stream contamination, the extent to which plastics can be chemically broken down, and the cost implications of transportation in recycling. However, Fred recognizes that chemical recycling can take various forms and be viable depending on specific circumstances. He mentions examples of recycling initiatives that focus on saving space in landfill waste cells. Moreover, he highlights the potential value and marketability of recycled plastics, particularly for niche markets that prioritize sustainability. Fred also emphasizes the importance of considering the actual carbon footprint and performance of recycled materials, citing the example of Lego's decision not to use recycled PET due to its worse carbon footprint. Despite the challenges and potential complications, Fred encourages attempts at finding solutions and understanding the intricacies of the process.

Bio-feedstocks

Fred's outlook for the biofeedstock sector is optimistic, especially when it comes to cellulosics. He believes that there is a significant amount of agricultural waste material, approximately a billion tonnes, that is not being utilized. By converting this waste through thermochemical processes into equivalent fuels, Fred estimates that it could produce five times the volume of corn ethanol. While he acknowledges the challenges and drawbacks of using agricultural waste as biofeedstock, such as contamination and fire hazards, he sees great potential in utilizing woody biomass. He highlights that woody biomass can be grown at large scales, has stable supply chains, and offers valuable materials like lignin. However, he also notes that regulatory limitations prevent the full utilization of woody biomass, with only a small percentage qualifying as “renewable” under current regulatory definitions. Despite these obstacles, He believes that the biofeedstock sector will evolve over time, with specialized applications emerging first and then progressing towards fuel production. He envisions a distributed network for biofeedstock processing, as transporting biomass over long distances is not cost-effective. Ultimately, Fred is optimistic about the potential impact of woody biomass and the advancements in technologies that can unlock its value.

Career Perspectives from Venture / Corporate

Fred has a unique perspective on his career, having worked in both corporate and venture companies. In the corporate setting, he enjoyed the benefits of having access to massive resources, such as databases and experts in analytics and engineering. The work processes were well-established, providing a steady environment to learn the basics. However, he found it to be boring and limiting in terms of innovation. In the corporate world, standardization often overshadowed the desire for innovation, and Fred felt penalized for his exceptional performance. On the other hand, in venture companies, Fred experienced a more dynamic and impactful environment. He felt connected to the business on a daily basis and saw the direct impact of his work. Although there was more pressure and accountability in a startup, Fred appreciated the opportunity to be recognized for his achievements and felt a greater sense of ownership. Moreover, Fred highlighted the networking opportunities he gained in the venture space, which exposed him to influential individuals and provides a different form of job security than the corporate settings. Overall, Fred values both his corporate and venture experiences but finds the startup environment more personally fulfilling and exciting.

About Fred Moesler

Fred Moesler is an experienced executive leader who has held strategic and technical roles in various types of companies, including large corporations, emerging companies, and venture-funded startups. He has extensive expertise in the development and commercialization of bio-based, chemical, and hybrid processes. This includes areas such as biopolymers, biofuels, lignocellulosic deconstruction, and direct air capture of carbon dioxide.

Currently, Fred serves as the Chief Technology Officer at Global Thermostat, a leading company in direct air capture. He has also held leadership positions at Renmatix and other notable organizations. Fred is well-known for his exceptional fundraising achievements and his groundbreaking contributions to technology. He has been part of teams that have won three Presidential Green Chemistry Challenge Awards.

Fred's innovative thinking and strategic approach have earned him a strong reputation in the industry. He is committed to driving sustainable solutions and is considered an influential figure in the field.

About Growth Arc Advisors LLC

After a 30 year career as an executive in the chemical industry, founder Kendall Justiniano started Growth Arc Advisors to help chemical business leaders implement the new thinking required for changing fundamentals. We're experienced industry operators who know the old playbooks, their gaps, and the new pages required.

The firm delivers customized engagements for Materials Executives in 3 key areas:

Commercial Effectiveness: increasing growth revenue through proven next-level commercial practices, including digital sales & marketing.

Strategy: helping clients navigate threats generated by sustainability, digital, and global demand shifts.

Innovation: accelerating return on innovation through focused investment.

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