Philanthropy at Rawabi: The KAUST Endowment

Version 1.0

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Recently, an announcement was made about the establishment of The Rawabi Holding Research Chair in Solar and Photovoltaics Engineering through an endowment contribution to King Abdullah University of Science and Technology (KAUST). We can see how Rawabi has come a long way in its role in the region's economic development and sense of responsibility to the environment in which it operates. As soon as our corporate identity and purpose statements were articulated immediate actions ensued in a successful and exciting demonstration of the maturity in our corporate culture, which brings Rawabi Holding Company to best-in-class (BIC) level company, in my opinion.

Putting it into perspective, this generous philanthropic support of KAUST is a vital part of accomplishing its mission. The aim is to educate solar energy science professionals, discover and translate advances in the engineering and physical sciences, and model the best practices in the energy production industry. This is a vivid exemplification of what Corporate Social Responsibility is. But, if it's not hot air, what is it? To appreciate this commendable act of generosity, we need to understand the endowment (in general terms), its relation to society, the subject of this endowment, and what it could mean.

Corporate endowment gifts to universities and colleges are an investment in the future of their important academic work by providing them with a vital tool to ensure faculty excellence. Rawabi's endowed chair will provide invaluable financial support to be used in research, teaching, or public service activities. Most of all, it will honor and recognize the distinction of superior faculty as a recruitment and retention tool, attract top students with endowed scholarships or affordable tuitions, and help KAUST fulfill its mission of providing excellence in education.

The endowment is provided to exist in perpetuity. That is by investing it as principal and spending the income on the creation of a thriving learning environment, on the assimilation of the new findings into practice, on the initiation of a ground-breaking study when we need it the most, and on the development of a specialized field to address our energy market leadership. The fund is managed to provide a permanent source of income through careful and diverse investment strategies, much like a mutual fund, that may allow for a consistent investment approach to better control risk since the investment is not focused on near-term performance results.

University chair endowment spending is subject to spending policies. These policies are set to ensure robust investment returns such that any increase in spending can be sustained in the future. Investment strategies and spending policies often lead to real growth in the endowment, thus adding benefits to current students and society. Typically, an investment return would be in the 10 percent range to achieve a payout rate of 5 percent for support of the charitable purpose of the endowment, reinvest part of the earnings to maintain the endowment's value relative to inflation (of up to 3.5 percent, for example), and pay for investment management costs (about 1-2 percent).

Since the primary purpose of the Rawabi Endowment is to directly support and sustain teaching, research, and public service, we expect the effects to be seen in many aspects of society: business, manufacturing, culture and society, and the environment. It is a vital source of revenue for the Chair to make innovation and breakthroughs that enrich our daily life possible. University research leads to new technologies that, in turn, create new industries and economic growth. This is a direct contribution to the young Saudi innovation system that will support our nation's economic competitiveness.

Keeping tabs on the fund's impact is also possible. The Chair Holder would submit yearly narratives of the past year's activities and use of the endowment funds to the department Chair or research head. This narrative is used in preparing a yearly report to the donor(s). We can also expect interaction between the

donor and the Chair Holder in the form of events held by the department such as invitations to lectures or conferences organized by the Chair Holder, invitations to receptions, or invitations to general or private meetings. This should be spotlighted through publicity and/or public announcements.

Research in renewable energy sources has a huge contribution to make in creating a sustainable energy system. It will help to mitigate climate change, increase the security of our global energy supply system, and give us access to affordable, clean energy. Research and development (R&D in the intended sense of the term) in this field has many areas to focus on, some of which are:

- Improved performance, including conversion efficiency, reliability, durability, and lifetime;
- Advanced manufacturing techniques for components;
- Reduced material requirements, especially for toxic materials;
- Sustainable production process
- Methods of integration into infrastructure

Photovoltaics, in simple terms, is the science or engineering field of direct conversion of light into electricity, at the atomic level. Some materials existing in nature exhibit a property known as the 'photoelectric' effect that causes them to absorb photons (particles of light) and release electrons. This phenomenon can be harnessed by capturing those electrons to produce an electric current that can be used as electricity. This mechanism of conversion has efficiency to it. Efficiency is related to converting all/most of the photons with the desired energy to electrons. Unfortunately, this is not the case because some photons cannot be used due to material characteristics (physical constraints) and the operating and production environments. Depending on the desired energy and amount of electricity to be generated, the total number of photovoltaic cells can be determined. Harnessing the entire band of light energy to generate electrons is just one example of where the focus of R&D can be. In this case, the focus can be on raw materials and/or solar cell (semiconductors) manufacturing. Of course, there's still the conundrum of the support infrastructure for electricity storage that needs to be optimized.

A number of solar cells electrically connected to each other and mounted in a support structure or frame is called a photovoltaic module. These modules are designed to supply electricity at a certain voltage level. But what's important is the amount of electric current produced (electrons). The electric current is directly dependent on how much light (photons) strikes the module. Multiple modules can be wired together to form an array. In general, we need modules or arrays installed in large areas to produce more electricity. Just like batteries, modules and arrays can be connected one after another or beside each other (technically known as in series or parallel) arrangements to produce any required voltage or current combination. If the modules are made of materials that can respond efficiently to the sun's spectrum range, assuming minimum ray refraction or reflection, then most of that energy can be absorbed to produce large amounts of electrons.

This hindrance can be overcome by solar cell manufacturing methods. The cell consists of multiple layers of different elements. These layers are called junctions. Much of today's research in multi-junction cells focuses on gallium arsenide. Such cells have reached efficiencies of a modest 35% under concentrated sunlight. The solar cell's surface and ambient temperatures also affect the conversion efficiency. Cooling can improve conversion but is too expensive to implement.

Today, this technology is used modestly on a small scale due to efficiency, associated costs, and maintenance. This deems it impractical as well as unfeasible as an alternative and independent source of energy to power our homes, factories, or even vehicles. But we can imagine our environment and quality of life with such sources of energy (solar or wind).

The socio-economic implication of the Rawabi Endowment is far reaching. A transformation of the global energy system will protect the global life-support system, especially by mitigating climate change; eradicate energy depravation in remote areas; reduce the risk of geopolitical conflicts over energy sources; and establish a secure supply system. The trigger for this is basic research supported by a thriving culture that is curious, imaginative, and capable of investigating and inventing, and that aspires to a better quality of life. The Rawabi Endowment is only one part of a complete system of social responsibility in our company.