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APS1012 Management of Innovation – Final Team Projects, Summer 2013 (10-day class)**Global Sustainability**

Energy is the lifeblood of modern society, yet our current development strategies are unsustainable and are leading to resource depletion and climate change. To overcome the status quo, we need to find an engineering solution. We propose and evaluate an approach that is heavily focused on technical solutions for energy generation, storage and conservation, combined with policy initiatives. Independent surveys of the technology landscape, its feasibility and the cost of energy conserved/generated are presented for each strategy. Existing policies and global conventions are examined, and recommendations provided towards a framework that can solve our global energy crisis.

**Energy Generation:**

A variety of old and new renewable energy sources are evaluated. Biofuel, nuclear and hydroelectric power is found to be most viable. A distributive energy deployment with biomass, solar and wind is recommended for Africa, and centralized deployment of biomass and nuclear was found to be most viable for the EU. To meet Asia's thirst for energy, the optimal generation strategy includes biofuel, nuclear and hydro power. Long term possibilities such as microalgae are recommended for North America.

**Energy Storage:**

Energy generation is critical, to fully harness renewables and enable novel energy use patterns. The key criteria for storage technology is that it should be inexpensive, scalable, reliable and safe. Pumped storage hydroelectricity, hydrogen fuel cell and molten salt batteries were evaluated, with molten salt batteries deemed the only viable option. This technology is very much in R&D phase, and significant barriers such as lack of large scale adoption and high capital requirement impedes its growth.

**Energy Conservation:**

Energy conservation is the most effective method to abate resource depletion, with significant benefits to individuals, national governments and the world. Energy efficient lighting, green buildings, electrical vehicles and net metering were found to be the most effective means of conservation. The barriers to energy conservation are multifaceted, including inertia amongst incumbent industries and opinion makers. Green building conservation strategies alone would save \$130 billion in future energy costs, as well as being environmentally and economically positive.

A series of regulatory, fiscal and public finance policies were reviewed based on their effectiveness and the potential for integration with technological solutions. We propose a plan that will utilize carbon taxes to incentivize conservation technologies, and use the tax dollars raised to support renewable power generation and further R&D of storage technologies. Based on our recommendations, €117 billion value will be created and 4.1 Gigatons of CO<sub>2</sub> abated, equivalent to moving 171 million of cars off the road. This will significantly reduce greenhouse gas emissions and maintain a sustainable environment.