Institutional Analysis of Information about Algae Bio-crude Innovation by Sapphire Energy, Inc.,

Part 1: Static Analysis
Collective Action:
This case focuses on information provision by Sapphire Energy that is therefore a part of the innovation feedback system. This information is a public good because this is the information that is available for collective action. Innovation information primarily exists in other forms such as private goods and club goods, but this information cannot be used to inform our common future. It is the provision of this public good that is the subject of analysis because it provides insight into the sustainability of the future. Sapphire Energy is a company that is producing crude oil from algae. The information used in this case study came from Sapphire Energy's web page or was linked from there. Each piece of information was categorized using the SES variables of Ostrom 2007 and is available here.

This CPR report was entered in 2013 by Madeline Tyson at Arizona State University.

Background on Energy Information Commons and Sapphire Energy:
Choices about energy future is a commons in which the choices are theoretically endless, but the closer we get to what was once the future, the more constrained we become by what we understand to be possible. The information we get about a new innovation is feedback. It is this type of information that is useful in making other infrastructure provision choices such as education, laws, and roads that might be needed to support this technology, that is investigated here.

Sapphire Energy grows algae using the best practices from industrial agriculture. It feeds the algae carbon dioxide, nitrogen and phosphorus and grows it in open ponds. After harvesting it and removing a large portion of the water it converts it to crude oil by heating it at high temperatures and pressures using natural gas. This crude oil is then available for refining using existing technology. This process is easily implemented into the existing infrastructure and is cost competitive with existing crude oil. The technology is proven and Sapphire Energy is now in the scale up phase.

1.1 Commons Dilemma/Collective Action:

The commons dilemma is the provision of information that can facilitate a robust and viable society that uses algae based crude oil as the foundation of a social ecological system. This information is a public good because it is this information, which will be used for directing decisions about the future. Information is a good with unusual properties because there is very little control over its replication and use after releasing it, and businesses often fear that they loose their strategic edge if they provide too much. The business and research arms of Sapphire Energy Inc., are undoubtedly thinking strategically about many aspects of robustness but have stated that many

factors are outside of their "scope". (Xiaowei et al 2013) In fact, in analyzing the data that is available from them, it appears that the only part of their practice that is being designed with robustness in mind is the process of making crude oil, but even the inputs to the process raise many concerns about the robustness of the innovation overall, and could benefit from external companies or agents working to solve these problems.

After analyzing the information system produced by Sapphire a few things are clear. The first and potentially most important finding is that there is no ability to contribute, nor any rules available for how future users can contribute, respond, or gain more information. This renders the information un-actionable and an ineffective feedback system at best. Secondly, there is almost no negative information (about what can or has gone wrong) available, and there are therefore no solutions (or lessons learned) to problems available. Thirdly, several types of information are being adamantly non-disclosed, such as the locations of the scale up sites and what strains are being used. Fourth, the subject of how will benefits will be re-distributed is non-existent, although Sapphire Energy has been the beneficiary of many infrastructure provisions. In general there is only limited and very general information available about the system.

1.2 Biophysical Context (IAD):

The biophysical context of the innovation space plays a major role due to the constraint that information is primarily embodied within the researchers and employees of Sapphire Energy. They have 4 facilities (2 in California and 2 in New Mexico), which are privately owned and operated.

The biophysical context of the information itself, through the Internet, creates an interesting dynamic because it is easily copied and easily accessible to anyone with a computer. The ability of people to copy has probably increased their desire to gain patent protection and their reliance on trade secrets. Sapphire Energy has over 300 patents acquired or pending, and in published interviews they mention several aspects that they are unwilling to share and prefer to keep as a trade secret. Although it is common practice for many modern businesses to use wikis or other online tools for learning, it does not appear that Sapphire is pursuing this option and they are not looking for feedback or partnerships, which they do not initiate. This may be influenced by their fear of having their ideas and concepts stolen, which is mediated by the physical context of the internet.

1.3 Attributes of the Community (IAD)

The community that has rights over information is made up of a variety of people with different backgrounds such as business-oriented people, researchers, lawyers and investors. They also have a network of partners and investors that includes businesses such as Monsanto and Phillips 66. It is clear that a primary attribute within the community is that they value the importance of energy, and crude oil in our economy and our livelihoods.

One attribute of the community that clearly affects their information provision is their business ethic with regard to performing for shareholders and investors. Although there is a clear reliance upon other parts of the system, it appears that there is little value held in concepts of equity, or a fair distribution of benefits in the future outside of shareholders and investors. It appears that there is no consideration for the longevity of those factors that are "outside their control" and as such they are not publically considering support or benefit distribution towards any of the mechanisms which might support those external variables such as roads, pipes, harvesting more diverse inputs such as CO_2, fertilizer or an educated and healthy work force

Rules in Use

Public infrastructure, monitoring, and enforcement

The public infrastructure is the website which is maintained by Sapphire Energy as it is the primary location for information about the system. Other documents relevant to the company are linked from the webpage.

Sapphire is making prolific use of the management and exclusionary rights. The rules that would allow for access, contribution, extraction, and removal by future users are simple and enforced through the design of the website such that there is only one rule that is relevant to future users and the enforcement of this rule is bounded by the biophysical context of the website's design: You may access limited information.

The other information rule, which is prescient, is the disclosure requirement of the specification portion of their patents. Due to the exclusionary language used in these documents in which only PHOSITAs (Persons Having Ordinary Skill In The Arts) are expected to be able to understand them, we have not considered them in this analysis, but they should be considered in future analysis.

1.4 Evaluative Criteria and Outcomes:

It was evident in the information that a primary criteria is generating value for its shareholders and investors. The primary metrics for this appear to be, patentable innovations, completion of milestones, and price point calculations. While this process may be cost competitive with crude oil, there is no indication that it will be robust to other types of shocks.

Bibliography:

Anderies, J., Janssen, M., Lee, A., Wasserman, H., 2012. Environmental variability and collective action: Experimental insights from an irrigation game. CSID Working paper.

Dedeurwaerdere, Tom, 2005. The Institutional Economics of Sharing Biological Information. 7th International Bioecon Conference, Kings College, Cambridge, 20-21.

Hess and Ostrom, 2005. A Framework for Analyzing the Knowledge Commons : a chapter from Understanding Knowledge as a Commons: from Theory to Practice. MIT Press.

Ostrom, E., 2007. A diagnostic approach for going beyond panaceas. PNAS, 104:39

Xiaowei, L., Saydah, B., Eranki, P., Colosi, L., Mitchell, G., Rhodes, J., Clarens, A., 2013. Pilot-scale data provide enhanced estimates of the life cycle energy and emissions profile of algae biofuels produced via hydrothermal
Liquefaction. Bioresource Technology. 148