Final Report

Bonneville Power Administration

Presented by Mr. Terry Oliver

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1. Executive Summary

Most of the company will measure their success by looking through their stock price and share level because it is the most effective way to see how the business is doing in the economic world. However, not all of the company can be measures in this way because some of the companies do not compete with other in order to survive in the fast pace economic world. Bonneville Power Administration is one of the companies that do not count for their stock price to getting higher. They are a public agency that generating power from the Columbia River to service customers in Pacific Northwest. Most of their business activities will focus on research and development to improve their service of energy efficiency and transmission system. However, the environment issue of wildlife and fish is also in the company concerned. One of the departments that are the key success for the company is technology innovation office that Mr. Terry Oliver is the chief of the department was the guest speaker for competitive strategy class. In order to understand their business clearly, the research team analyze the company by adapting the tool from the class: top-down logic and bottom-up logic. Moreover, in his presentation, he also mentioned about the technology innovation projects about research and development of energy efficiency (Smart Grid) and transmission system (Helical Connector Shunts). The case studies were analyzed by using knowledge-utility transformation, risk and return dimension and also applying the knowledge-value cluster to understand the company's activities.

2. Company Background

The Columbia River is the heart of the people in Pacific Northwest region of North America. It is the one of the largest river in the United States. [1] Its starting point is from Rocky Mountains of British Columbia and then flows pass Washington State and Oregon State in the United States before going to Pacific Ocean. The Columbia River is not only the origin of life, but it is also been the beginning point of one important company in the Pacific Northwest, Bonneville Power Administration.

2.1 History

"*The next great federal hydroelectric project would be built on the Columbia River to prevent extortion against the public by the giant electric utility holding companies then dominant in the region."* [2]

This is the promise from Franklin Roosevelt gave to the citizens in the Pacific Northwest while he was running the president campaign in 1932. The concept of hydroelectric power was first supported by him in New York as a governor in 1920s. Then, in 1933 the Bonneville and Grand Coulee dams were built. With the concept of providing the power at the cost of its generation, the independent federal agency would be created to sell the power from both dams. However, before becoming the company as nowadays, it was just a temporary Act from the Congress in 1937; the Bonneville Project Act, waiting for a Columbia Valley Authority to create. Because that Authority required multiple efforts, the Bonneville Power Project was turned to be the Bonneville Power Administration in 1940 providing and selling the electric energy from federal dams in the Pacific Northwest. [3]

2.2 Present

The electric power that the citizens in the Pacific Northwest consume is come from BPA around one-third, or the BPA serves their service to around 12 million customers with 15,239 circuit miles of transmission lines. Even though it is a public agency, the revenue of the company can pay their cost. Thus, residents' tax is not related with the company's business. Figure 1 is illustrated the source of revenue of the company in 2012 that most of the revenue is come from their service that they provide their owned utilities to the customers that their important clients are cooperatives, municipalities and public utility districts. BPA sells the power as the wholesale to these firms and non-firms at very low rate price as their mission that "to create and deliver the best value for our customers." [4]

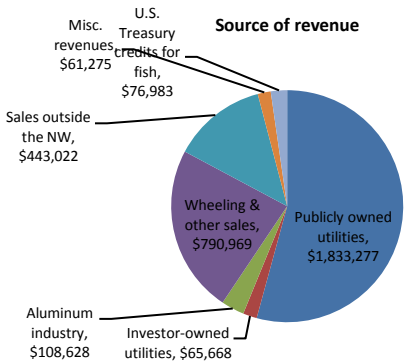

Figure 1 Source of revenue in 2012 ($ in thousands) [4]

Nowadays, the company does not only operate and maintain the power from 31 federal dams to the region. Energy efficiency, renewable projects, other new technologies and also the environment also become the company's responsibility for the Pacific Northwest.

3. Synopsis from the presentation

In the presentation about the Bonneville Power Administration Mr. Terry Oliver who is the chief officer of technology innovation part, mentioned about the missions, visions and strategies of the company that they have had over the past few years. These three are the important factors in order to control the direction of the company.

Mission

BPA is a public organization that services the people who live in Pacific Northwest. As mentioned earlier that the company are not only concerned about the generating adequate and low price power to the customer, they are also care about the wildlife and fish that live in and near the Columbia River.

In the company's mission, firstly they are focusing on providing enough power and also efficient to their customers at very low rate as the first intent of the company to prevent a private power company from becoming a monopoly in the electricity business. Even though they provide the energy at cost-based rates, they are also still thought about their stakeholders and their return on investment.

A transmission system is the second thing that the company is focusing on. BPA is a large public organization that provides the electricity to the citizens in Pacific Northwest. Their transmission lines are served to eight states: Washington, Oregon, Idaho, Montana, California, Nevada, Utah, and Wyoming that they receive the power from federal and non-federal generating units. Thus, there are lots of customers who get the service from BPA. Stability and reliability of electric from their transmission system become the important work of the company.

Lastly, most of their projects are related with the hydro system of the Columbia River. Thus, the wildlife and fish receive the effects when the dams were built. The company also concern with this issue, so in their mission also mentions about enhancing and protecting the environment, fish and wildlife.

Vision

In order to be success, the management team needs to create a clear vision to the organization. The vision statement from Bonneville Power Administration is emphasized on the future of the Northwest region. With the objectives of making the economic in this region stable and prosper, and also concerning about the environment, their vision is stretching on leading the region with their strengths in energy and transmission system. These two systems need to be reliable at low rate and also not destroy the environment, so the organization can be accountable to the region.

Strategy

With the long-term objective of the company that need to support their mission and vision, the strategy of the company was created by adapting the balance scorecard method to suit with the company's perspective. Thus, in their strategy the four dimensions are stakeholder, financial, internal operation, and people and culture. The relations of these four elements that interconnect and focus on using their resources and efforts in the effective way to achieve the company's goals are also being used to create the matrix between the vision and the strategy of the company as shown in **Error! Reference source not found.** below.

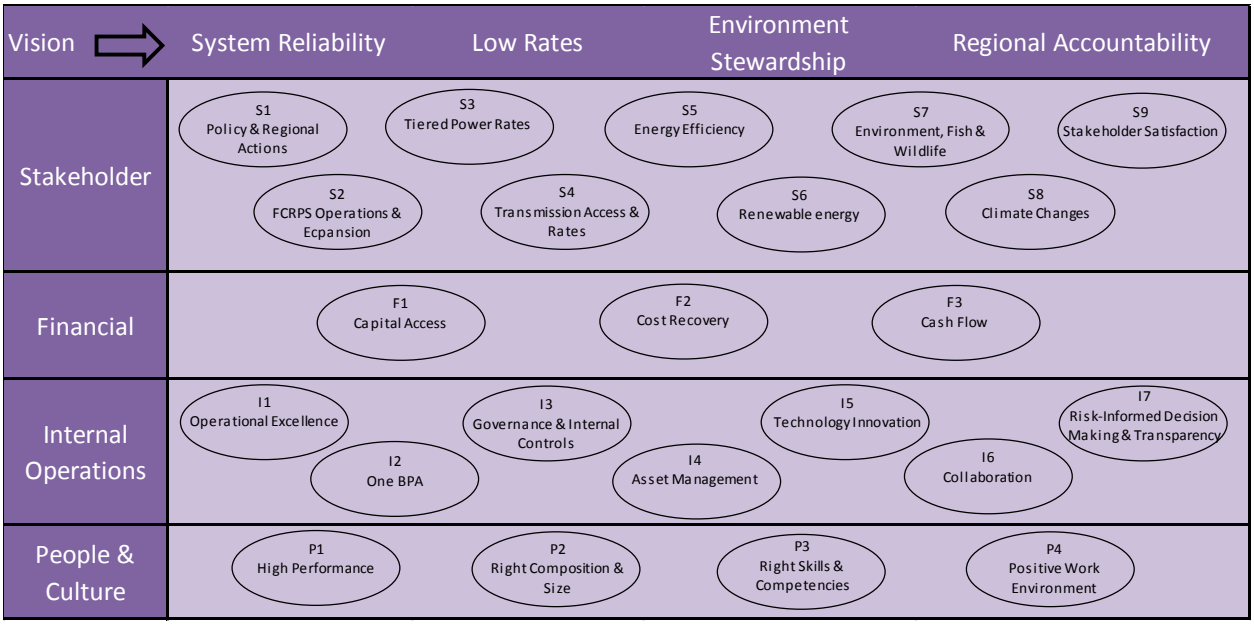

Figure 2 Strategic Objectives [5]

In each strategy, it will have subcategory that will relate to the company's vision differently. One of the key components in internal operation element is technology innovation. It is a key success of the organization if they can relate their business to the technology. Thus, research and development from this section will help the company prosper. The company applies the technology roadmap idea to identify the right factors and areas of the technology for the best benefit to the organization and their customers. [5]

4. Company Analysis

In order to make the company prosper and success, the management level and business level should have the same idea and thinking about the company's direction, objectives and goals. To make it understand easier, the top-down and bottom-up perspectives are used to analyze the organization.

4.1 Top-down perspective

The Table 1 below illustrates the perspective of the top management level that they should start with broader ideas that come from the environment or creating the planning scenario for the company to the narrow thoughts about business and strategy models. [6]

Table 1 Top-down Perspectives [6]

Environment
Planning Scenario

Company

Business Strategic Model

Top-down Logic	
1. Scan environment of businesses	1. BPA create Five drivers for their business - Difficult Economic Environment - Climate Change Uncertainty - Renewable Energy Growth - Shifting Resource Condition - Compliance Requirement
1. Interpret changes in environments as threats or opportunities to businesses futures	2. Most of the energy from BPA is green and clean energy. Moreover, they can produce more than half of the wind capacity for the Northwest. BPA can increase the projects about renewable energy that also concerns about the environment
2. Analyze present business operation in terms of strengths and weaknesses for the future	3. BPA provides the power at very low rate, and they are the major service supply in the Pacific Northwest. However, BPA still face with the problem of operation and planning for the hydro system, and also the people expectation in an environment issue.
3. Redefine business portfolio strategy to create strong future industry positions	4. BPA company defines portfolio annually to keep the track for technology focus and areas.
4. Set targets for businesses and allocate resources	5. The strategic objectives are created in matrix form that connects their visions with their strategies.

Comparing the top-down analysis from Betz with the way that BPA does the business, it is clearly that the company scans the environment by looking to four dimension of the planning scenario: government, science and technology, economic, and culture. Then, five key drivers of the company are created that include Difficult Economic Environment, Climate Change Uncertainty, Renewable Energy Growth, Shifting Resource Conditions, and Compliance Requirement. [5]

Strengths, weaknesses, opportunities, and treats or SWOT will be known after observe the environment of the company. Even though there is a problem of global recession that decrease the rate of energy consumes, it affects to the company's capital investment. However, the company still provides the electricity at cost-based rate. Also, with their power in renewable energy that they can provide more than half of the wind energy that can generate in Pacific Northwest and also hydroelectric, their ability to cope with the growth of green energy does not show significant effects to the company. Moreover,

most of the energy from BPA is clean energy, so the legislation from the government about carbon emission becomes less tense. Thus, it is a great opportunity for the company to create more projects about renewable and clean energy and also maintain it at very low price. Moreover, with the shutting down of coal plant, the need of power is shifted to gas and also other clean energy. The company

However, because most of the resources of energy that BPA is responsible for are the hydro system that is very challenge to manage in different season, and also the impact to environment, wildlife and fish is unavoidable, investing on the new projects and planning should be aware of these issues to lessen the trouble that might happen in the future. Not only the problem of managing the river and protecting the environment that need to be concerned, the reliability standards of the electricity also increase the project investment.

As the technology innovation section is the key component of the company, there is an annual portfolio funding to identify the appropriate technology and areas for the company focus. BPA create the Technology Confirmation and Innovation (TCI) Council to review each projects in portfolio to check that the projects are worth for funding and go along with their mission, vision and strategy. [7] Finally, the short-term and long-term strategies are created to support their goals and objectives same as the **Error! Reference source not found.** above.

4.2 Bottom-up perspective

In contrast with the top-down, bottom-up perspective will look from the narrow point of business plan to the larger idea of strategic plan for the organization. As the earlier mentioned that technology innovation is very important to the company, so the bottom-up perspective for business level will be emphasized this research and development section.

After the technology innovation office receives the funding from the company, they will allocate the resource to different areas. Each area will have different portions because it needs to be based on the company's mission and vision and also portfolio in each year. Figure 3 below indicates the allocation for different focus from the technology innovation office. The largest percentage is the project for energy efficiency. It is an important issue to the company because it can fulfill their mission and vision.

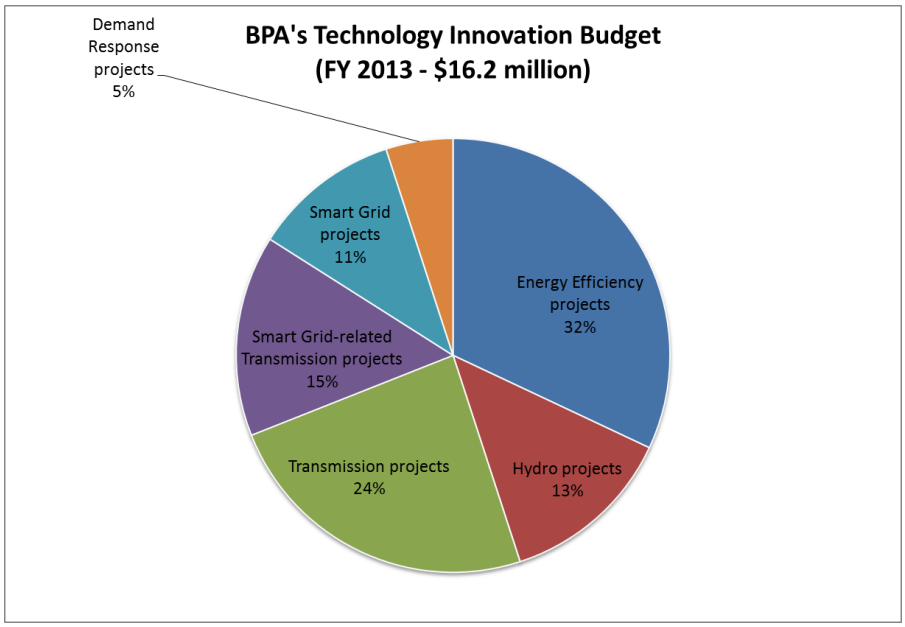

Figure 3 BPA's Technology Innovation Budget (FY 2013-$16.2 million) [8]

Even though BPA has most of the resources such as funding, equipment, experts, and knowledge, they still need professionals from the outside to help the company in order to achieve their short-term and long-term outcomes. Partnering with other utility companies, universities, researchers, and technology developers from different areas of experts and various regions throughout the Northwest will give BPA opportunities in improving their research, and also more budgets will come to the company. [8]

The relation between the company direction and the business level activities should be link and make it cohesive because the business challenge and technology gap can identify if business level understand the firm's goals and objectives. From the report of Technology Innovation Office shows that their agenda and BPA's strategic priorities are connected together in the way of improving transmission system and energy efficiency, and also managing the company's capabilities and resources. [8]

Competitors are also the important component to make the company see what areas they need to improve and can moving forward. During the presentation from the guest speaker, Mr. Terry Oliver mentioned that because BPA is a public agency that the focus of their business is creating the new idea and technology that is efficient and can provide to the customers at low-rate, so the return on investment will not be the top priority for the company. Consequently, BPA does not have the actual competitors same as other businesses. However, the competitors of BPA are slightly different because they need to be concerned about the political, technical, and social expectation issues from the outsiders especially the public reputation about the environment impact.

Finally, the strategic plan is created that is based on the ideas of business level focus including energy efficiency, transmission system, and resources. However, the plan will need to connect with the firm level's goals and objectives in order to have the same understanding in company mission and vision.

Table 2 below demonstrates the idea of bottom-up perspective from Betz and also adapting version for Bonneville Power Administration.

Table 2 Bottom-up Perspectives [6]

Company
Strategic Plan

Operating Unit

Business plan

Bottom-up Logic	
1. Trends in sales and customer applications	1. The strategic plan is created to support company focus of energy efficiency, transmission system, and resources.
2. Benchmark products & services against competitors	2. They are public organization, so they do not have actual competitors same as other companies. However, they competitors are technical, political and public expectation issues.
3. Anticipate innovations in products/services & in production/distribution	3. The agenda from technology innovation office and company's strategic priorities are linked together to identify business challenges and technology gaps.
4. Identify operations & support functions for process reengineering	4. Technology innovation office collaborates with utilities, universities, researchers, and technology developers to improve their capability.
5. Formulate business plan with required investments and projected ROI	5. After the technology innovation office receives the budgets from the company, they allocate the budgets to different projects that focus in different focus areas.

5. Key Ideas

5.1 Important points

The implementation of R&D in BPA represents a growing recognition of the importance of R&D within utilities, and is based on a combination of perspectives, ideals, concepts and strategies:

Alignment

Alignment represents the most important concept in the implementation of any R&D program. As value is primarily intangible and difficult to measure, being able to align initiatives to the larger organizational strategies can illustrate how value might be realized through implementation. In this, it becomes the responsibility of R&D management to both determine how to align R&D initiatives and advocate initiatives to upper management.

Accept Risk

Secondly, accepting risk is an inherent perspective to take when managing an R&D program. As outlined in the presentation, the majority of projects is destined to fail (~80%) and should be an accepted risk when initiating projects. However, accepting risk does not translate directly into accepting failure as statistically inevitable. Mitigating losses due to failure becomes equally as important as accepting the risk of failure. Building in go/no-go checkpoints in the R&D project agenda can aid in preventing losses from accruing damaging costs. In essence, this prevents troubled R&D projects from becoming "too big to fail" or from failure becoming too costly.

Portfolio and directing Research Agendas

Building and maintaining R&D portfolios from multiple, incremental and indirectly aligned projects, as well as managing research agenda represent a form of competition management. Portfolios of varied research projects allows flexibility and broader application of knowledge in creating value for the organization, and managing research agenda involves cyclically revise and hone key projects and pruning unnecessary ones that do not align. These actions recognize the existence of competition in forms different than that of traditional industries. Flexibility and variety keep the possibility of value creation greater, while honing can better focus the alignment of projects likely to provide downstream value.

Competition exists even in Utilities

From building competitive edges in portfolio and agenda management, the recognition that competition exists is necessary. This can involve competition for project funding, whether federal grants for research or internal competition for budget inclusion. It also consists of competition for first mover advantages on an organizational level.

5.2 Evaluating R&D

Highlighted in Mr. Oliver's presentation was the inherent intangible value provided by R&D. The ability to evaluate potential value created can provide tangibility to generally intangible value chains. Building on various knowledge asset chains as well as the Risk-Return concept, qualitatively evaluating R&D can be possible.

5.2.1 Modeling R&D Evaluation

As knowledge is generated through the transference of Nature to Utility through research, manipulation, and eventually economic utilization [9], [10], combining the Nature-Utility (N-U) perspective (bubble graph) with the transference utility chain, one can qualitatively map each N-U region with a segment on the K-U axis. In so doing, a "meta-coefficient" of application on the N-U perspective can be used to align projects in parallel to where they fall on the K-U axis.

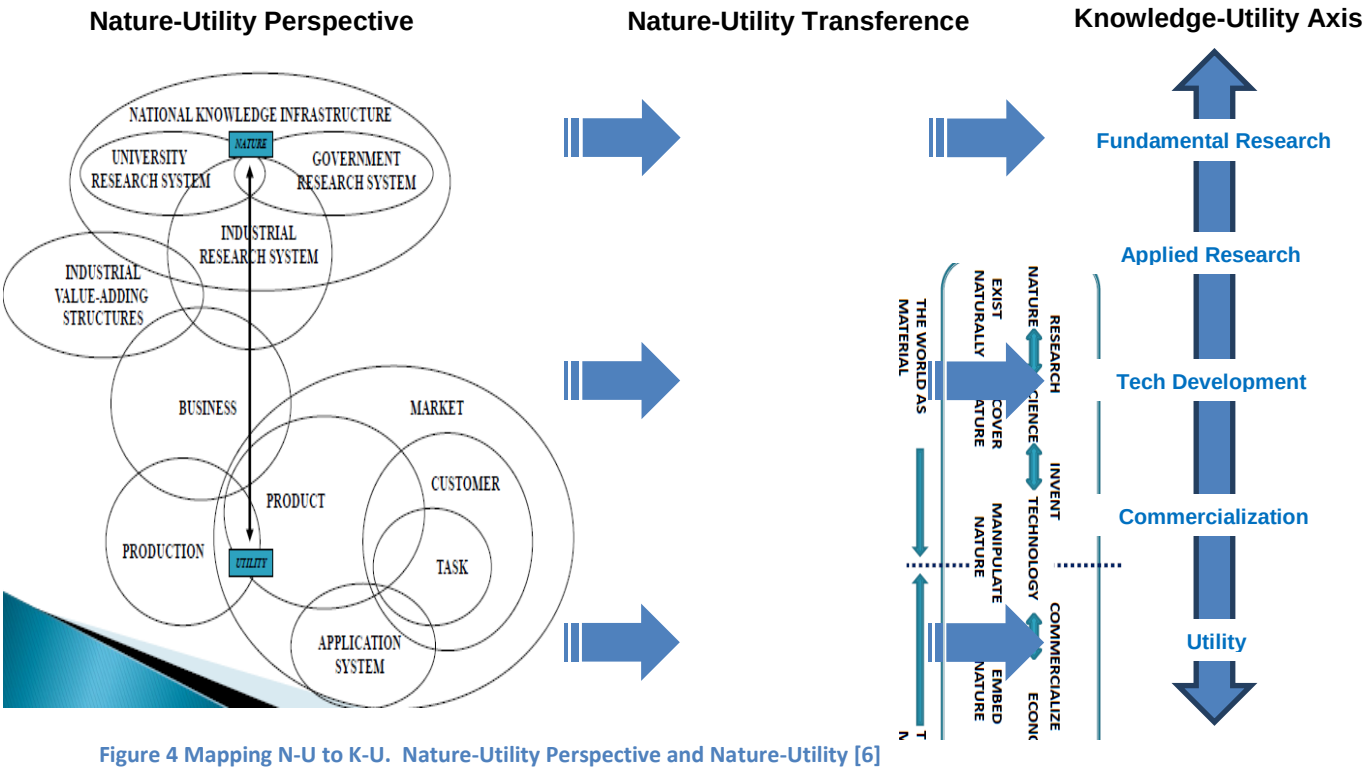

Figure 4 Mapping N-U to K-U. Nature-Utility Perspective and Nature-Utility [6]

Applying this mapping of N-U to the K-U axis as a third dimension on the general Risk vs Return chart, a model for relating R&D to higher strategic alignment appears:

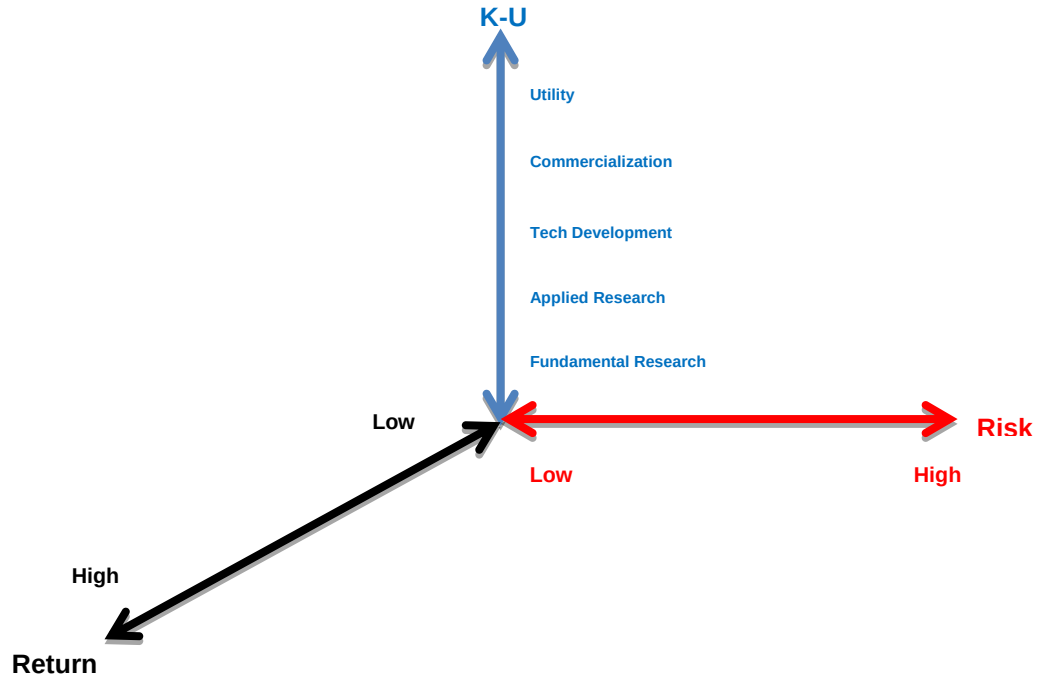

Figure 5 The Risk-Return-KU volume. Mapping R&D projects along these three axes can qualitatively evaluate value and alignment

In general, projects can then be qualitatively described as a function of risk, return and K-U locus as a reflection of N-U. Using this amalgamation of concepts, R&D projects can be qualitatively assessed from a broad, top-down perspective. Interrelations and clusters can then be mapped within a single model.

As utility lays on the monetized/commercialized end of the N-U (and thus the K-U) spectrums, utility can provide a more immediate realization of value, however, on the nature/knowledge side requires some form of tangible value assessment. Understanding where each project is in terms of this model, justification can be made for keeping more high risk research projects if they appear to align with a broader spectrum of problems that provide value through utility.

6. Case study Analysis

For the purposes of this case evaluation, this qualitative analysis was applied to various R&D projects currently existing in BPA's portfolio (both presented by Mr. Oliver and ascertained from BPA's public portfolio).

6.1 Helical Shunt

A helical shunt is a device created to be fitted across transmission line connections, allowing carried current to bypass the easily worn connections. This project, as it feel in our study provided a high return, relatively low risk project that fell in the "Technology Development" segment of the K-U axis.

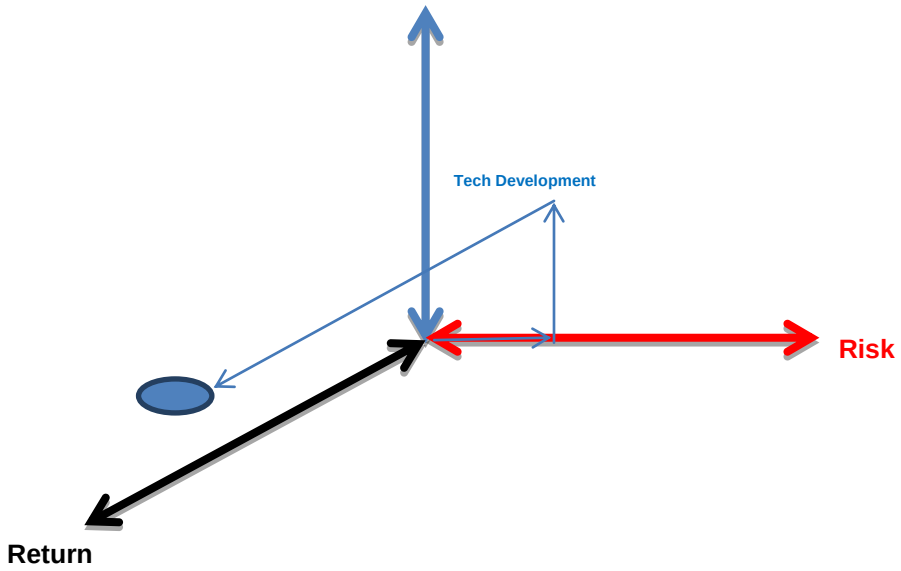

Figure 6 The Risk-Return-KU volume for Helical Shunt case study

In terms of alignment with the overall direction of the organization based on strategic value drivers, this project falls under mitigating monetary and resource expenditure. Due to the success of the device, miles of new transmission lines would not need to be prematurely replaced. The shunt could be fitted at a comparatively low cost (thus low risk) for a greater return (saving costs), within the context of the problem.

The location on the K-U axis speaks to the application based nature of the device. It was not a fundamentally new technology nor developed to be immediately commercialization. The solution based project therefore falls into the Technology Development segment.

The value created here was limited to the savings in line replacement and potential commercialization of the device. The location identified, coupled with a hard valuation (given the project's completion) could tangibly map value to the overall model.

6.2 Smart Grid Development

Smart grid development is perhaps the most revolutionary and ambitious project examined in this case. Aligned to address concerns on in resource availability, the necessity of clean energy, multiple generation sources, this perhaps shows the most immediate intangible value going forward.

Being early in development, smart grid systems can be broadly fitted into multiple segments, depending on the scale of the project. Primarily, for the purposes of this case, this R&D initiative appears to be high risk, high return and early applied research.

The risk in this project lay primarily in the uncertainty of application and perception of necessity. The return conversely is as high due to the revolutionary nature of the technology and the potentially "game-changing" delivery of energy from multiple variable sources. As stated in the case, the BPA project has grown immensely from its initiation becoming a widely cited "standard". This highlights another factor that drives up the return on investments and validates the continuance of the project.

The K-U location was assessed to fall in the Applied Research segment. As it is in early development, much of the development is focused on assessing feasibility, functionality, and prototyping. Through this combination of high risk and return and early development poses the greatest potential value generation of the projects examined.

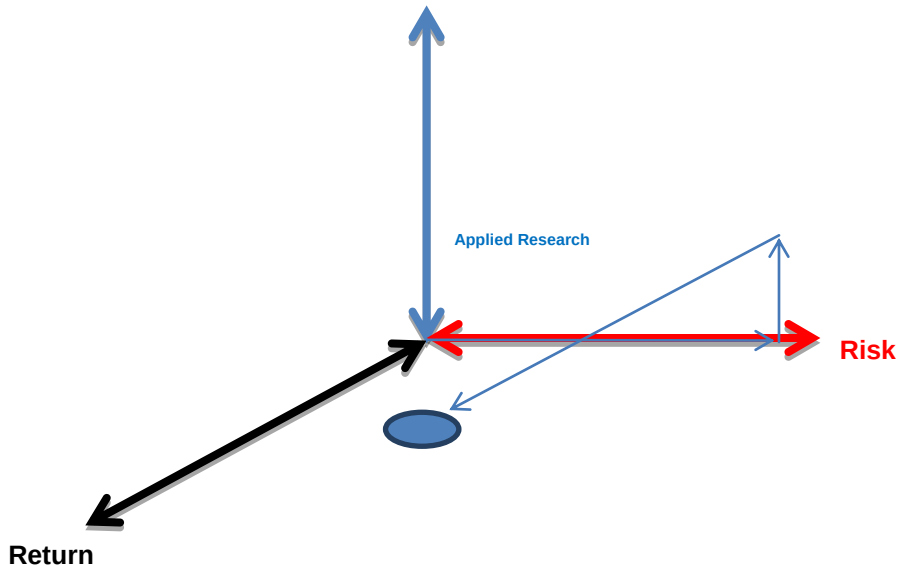

Figure 7 The Risk-Return-KU volume for Smart Grid Development case study

7. Conclusion & Further Research

Value created cannot be immediately divined from a project's placement on the three-axis technique, the tool could help illuminate potential value as it exists at some time in a development cycle. Going forward, an actual value factor could be assigned to various projects. From this, trends could then be established based on the three factor combination of Risk, Return and K-U location. Generalizing the value expected from a given combination of factors might allow for more focused alignment of projects based on the K-U extension of the existing risk-return matrix. Further research and data would be required to validate this technique.

Applying this tool to the entirety of an R&D portfolio, further illuminating visual representations of alignment based on the possible clustering of projects. Finally, examining how these clusters might align with the value drivers of an organization would lend to an overall tangible measure of R&D.

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