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Towards Excellence

ECOLAB STRATEGIC MANAGEMENT

BUSINESS STRATEGY PLANS

PRESENTED BY: HYEON GANG, PETRU BOLOG, JAMES GAUDET, JUSTIN
NGUYEN, LILLIAN GROTH

ECOTEAM

907 FLOYD AVE, RICHMOND, VA 23284

INTRODUCTION

Ecolab has become major industry leader in providing services, safe hygiene and energy technologies that protect consumers with best in class services and products. Research and development have grown dramatically over the years and continues making improvements as technologies advances in near future. Many of the resources that Ecolab provides are related to health care, maintenance, pest elimination, sanitization, cleaning products, wastewater treatment programs and more. Ecolab's main focus is "Circle the Customer – Circle the Globe" strategy that offers full range of products and services to core consumers (Gale 2007). In Ecolab's perspective, they want to clearly define their strategy focusing on their daily actions in making the products and expanding it throughout the world. The growth of the company has proven to be successful over decades which their products and services not only gave solutions to the core customers, but also managed to eliminate recurring problems when using their products and services. This continuing success drives their business growth above and beyond making the company strongly competitive in the environment.

Ecolab, originally Economics Laboratory was founded in 1923 when auto dealer named Merritt J. Osborn hired a chemist to develop his first new product called Absorbit. Absorbit was a product to clean carpets and this helped hotels eliminate time to take their rooms out of service from cleaning the carpets. Absorbit was first named as Evaporato and named his company Evaporato from his product which was created based on St. Paul's firm. However, this quickly changed to Absorbit and Economics Laboratory (EL), respectively. The company was named this way because Osborn described Economics as a

company that save customers time, labor and money. Osborn kept his motivation in making products through laboratory research (Gale 2007).

Absorbit was only moderately successful and Osborn quickly incorporated the company and raised \$10,000 from outside investors. This helped to sustain the company long enough to develop better selling product. In 1924, a chemistry student named Leonard E. Englund developed simple and effective cleaning compound. Osborn acquired it and named it Soilax as to combining the words “soil” and “lax” together. This was soon marketed for primary use in dishwashers and it became the key product and core foundation in future growth of the company, Economics Laboratory (EL). Soilax met customers’ expectations and needs in using the product and gave positive results. Many of the customers were ranged from restaurant owners and hotels using Soilax. The company soon expanded nationwide and the sales passed \$500,000. By the end of 1940s, it reached \$5.4 million (Ecolab Inc.).

During the Great Depression in 1933, Economics Laboratory went through challenges and hardships in profitability. The company had to force pay cuts to the employees. After a year, the company returned the profitability which was netted \$98.19. Major challenge Economics Laboratory encountered was when Calgon Corporation (competitor at the time) developed “superior automatic dishwashing detergent” called Calgonite. Calgonite was incorporated as “water-conditioning” chemical called sodium hexametaphosphate. This compound significantly reduced left over substance by other detergents. Calgon Corporation had edge of competitive advantage and Osborn quickly reacted by persuading them to be distributor of Calgonite. This new product was outselling Soilax by three to one. In 1936, scientists from Economics Laboratory created new chemical compound called sodium

tetraphosphate. Sodium tetraphosphate consisted of white texture, salt-like substance that was safe used in foods, similar to baking soda in modern days. The new chemical compound improved Soilax and named it “Super Soilax” to be more effective product than the original one. Economics Laboratory terminated distribution of Calgonite to concentrate selling new their new product. This angered Calgon Corporation and they went on filing patent lawsuit against Economics Laboratory in regard of Super Soilax they had invented. This didn’t go in favor of Calgon Corporation after unsuccessful attempt of the lawsuit. By 1937, 35 salespeople from Economics Laboratory located in different cities expanded rapidly selling the product worldwide (Gale 2007).

In 1950s, Osborn stepped down from his position as CEO while remaining as a chairman of his company. Edward Bartley Osborn, one of his founder’s son took over his position and Economics Laboratory soon expanded operations to include cleaning products for restaurants, food services, and more. International expansion began 1950s having annual sales of \$28 million. Economics Laboratory went through public for 100,000 shares at \$15 per share. Earnings per share quickly rose higher than average which was 15 percent annually. The profits of the company eventually reached 19 percent growth rate between 1974 and 1977. For the institutional side, this was the cornerstone of company’s success between the years from 1970s to 1980s. The business quadrupled. It generated a total figure of \$640 million by the ten-year period (Gale 2007).

In 1964, Economics Laboratory purchased Magnus Chemical Company Inc. to gain access of first industrial market. Magnus Chemical Company Inc. operated in metalworking, transportation, and petrochemical processing. The institutional division focused on dishwasher products and sanitation. On consumer division, they focused on floor cleaners,

dishwasher detergents, and laundry products. Magnus Chemical Company Inc. contributed \$12.1 million sales during the year of 1973 (Gale 2007).

In 1978, the sales of dishwashing detergents were slowing down in sales and international operations had downturn on profitability. Profit margin dropped to 10 percent which reduced profit gains for the company and made disappointment figures by the end of the year. Edward Bartley Osborn stepped down from his long tenure as CEO and the third descendant of Osborn family, S. Bartlett Osborn became new CEO of the Economics Laboratory. Economics Laboratory announced plans to acquire Apollo Technologies for \$71.2 million. Apollo Technologies were manufacturing corporation for chemicals and pollution control equipment and Economics Laboratory needed industrial market share to make improvements in profits. Economics Laboratory broadened its business in the industrial sector from the acquisition and raised industrial service operations into success (Gale 2007).

In 1981, new CEO named Phillip T. Perkins joined Economics Laboratory. His talent was overseeing in international operations. He developed plans for creating highly efficient network maintaining high growth rate for the company. In addition to his plan, he increased research and development spending by 25 percent for developing effective product for consumers (Ecolab Inc.).

By the early 1983, Pierson M. Grieve filled the position was replaced as new CEO. He displayed his talent for decisive strategic planning. He reorganized Magnus division issuing improvement in sales performance for certain foreign markets and expanding the product lines by hiring more salespeople. Although the sales reached \$670 million, debt had accumulated over the years and the largest customer base had shrunk

significantly. Grieve's strategy was to regain markets effectively. Economics Laboratory needed to broaden its customer base in its institutional division and reduce long-term debt which they did reduce by \$10 million. In addition, 1986 was a pivotal year, renaming Economic Laboratory to Ecolab to provide simple and worldwide identification of the company. Ecolab was also listed in New York Stock Exchange increasing interest of global investors (Ecolab Inc.).

In 1987, Ecolab went on to make acquisition of ChemLawn for \$376 million. ChemLawn operated in lawn care services and this was not favorable acquisition in Grieve's strategic planning because the cost of acquisition was too high. ChemLawn was unable to generate enough revenue stream to pay back the cost of acquisition. Ecolab management needed to increase revenue, therefore increased prices hoping to mitigate negative impacts to the company. However, ChemLawn customers were price-sensitive which ended up Ecolab using money from the acquisition. Service Master L.P. eventually purchased ChemLawn for \$103 million and Ecolab had to take \$263 million write-off from the earnings. It was a disaster for Ecolab but the company was able to recover. Grieve moved into new strategic planning "Circle the Customer-Circle the Globe." It emphasized Ecolab's intention to be worldwide leader in diverse businesses. Ecolab increased presence in different regions of the countries and achieved distribution and licensing agreements (Ecolab Inc.).

In 1991, Ecolab entered joint venture with Henkel. This became Henkel-Ecolab which was 50 to 50 joint venture. This move was to expand operations across Europe even though European economy wasn't making good performance. But in couple years, the company become the leader in hospitality cleaning, sanitizing, and maintenance. This helped

Ecolab to have net sales to generate 22 percent outside of United States. “Circle the Customer” strategy have been wide success maximizing its investments and ranging different range of products and services offered to customers. While concentrating institutional, industrial, and hospitality industries, the expansion of Ecolab have become huge phenomenon of successful company in achieving through challenging outcomes (Ecolab Inc.).

In 1994, Ecolab had constant growth in net sales and net income, accumulating sales of \$1.21 billion and \$90.5 million in net income. Grieve’s success began to pay off from his strategic planning and eventually came down to his retirement in early 1995. Allan L. Schuman became new CEO of Ecolab and continued with the “Circle the Customer” strategy. Under the new leadership, the products and services expanded geographic regions. In 1996, Ecolab purchased Huntington Laboratories Inc. which doubled annual revenues of the division. Ecolab later than purchased Monarch division of H.B. Fuller Company and Chemidyne Marketing division. Monarch division annual sales were \$30 million and Chemidyne had annual sales of \$17 million focusing on food and beverage division. The two companies were known for food cleaning in food processing industry. In 1997, Ecolab acquired Melbourne for \$130 million. It was chemical industry for cleaning and sanitizing products for Australian and New Zealand healthcare and industrial markets. It had fiscal sales of \$122 million (Ecolab Inc.).

By the late 1997, Ecolab’s institutional division grew rapidly. End of 1999, Shannon retired and Schuman was replaced as CEO of Ecolab. Ecolab hit the mark exceeding the revenue of \$2 billion for first time. In 2004, Douglas M. Baker is currently operating as new CEO of Ecolab and continues to release successful new products, such as water filters, coffee

makers, and more. As of 21st century, the company is always expanding selling its institutional products across apartments and building complexes. The products Ecolab creates is constantly evolving with new innovation and seeking out new customers using their product line. Ecolab's strategy has been unending success for future growth and core business in competition.

The sales of Ecolab are divided into four segments: Global industrial, global institutional, global energy, and other. In global industrial, Ecolab had generated 35 percent of sales providing water treatment, cleaning, and sanitizing to clients within manufacturing. Global institutional had 30 percent sales providing sanitizing products to retail industries, hospitalities, healthcare, government and more. Global energy also had 30 percent sales for chemical and water treatment in petroleum industries. The chemical treatment was for oil fuel substances that treat reservoirs providing clean water and eliminating bacteria. The last 5 percent consists of Ecolab's product for pest elimination and kitchen equipment repair and maintenance of the household (Bollinger 2016). The four segments outline different categories of sales in 2014. It is a unique way to diversify the sales into segments establishing different customer relationships and introduce new products and solutions from the four business segments of operation.

In the business development, Ecolab continues to strive forward and look for potential opportunities for making certain acquisitions for future growth. This would create major diversification of products and prospect the business overall. Business plan for organic growth as to combining the resources through acquisitions can be accelerated and increase revenue of the company. Organic growth would help reduce competitors within the arena and making sure their plans are always a step ahead among other competitors. As Ecolab

went through major challenges, the trend of their stock (ECL) shows exponential growth over the years. It shows us that Ecolab is a unique business. Ecolab have over 6,700 patents in their products and technologies. This allows Ecolab to sell their solutions 10 to 20 percent premiums compared to other competitors' offerings (Bollinger 2016).

Ecolab's competitive advantages are its dependable service quality and product. They stay consistent in keeping safe environment through their service and product, as well as having high expectation in customer satisfaction. Ecolab is positioned to handle the amount of scale and complexity due to its products and global service serving other countries in the world. Ecolab grows with other businesses and the products that Ecolab created strengthened their business model. 90 percent of their business comes from recurring revenue stream. For example, many of the consumers need Ecolab's sanitizer and will have to eventually reorder once the supply is limited. This represents customer relationship lasting long period of time and provides reliable cash flow and stable operating margins of the company. Ecolab is currently seeking invested capital to grow around 20 percent from their global market and prosper long term growth potentially increasing in market value (Bollinger 2016).

ENIRONMENTAL ASSESSMENT

One of the most important documents a business can come up with is an environmental assessment. The environmental assessment will formulate the goals and strategies for the future of the business. It can protect a startup business from making the most common startup mistakes. In our case, it can help prevent mistakes made from acquiring new businesses. An environmental assessment helps develop a business plan. A business plan is a written description of a business's future, it's a document that tells what you plan to do and how you plan to do it. It is basically the outline of a business strategy, where you start with a certain amount of resources and abilities. That is your starting point, then you plan out for the future (usually three to five years out) and you end up with a different set of resources and abilities. Without a good business plan, a business can find itself lost when it comes to critical decision making. Most businesses rely solely on a solid business plan in order to make decisions, whether they be long-term or short-term. That being said, let's take a look at some of the steps to making a thorough environmental assessment.

Before you can make an environmental assessment or a business plan, you have to take a look at the competition in order to see your standing in the competitive landscape. Before a company opens up anywhere, it's a good idea to see what businesses are in the area. A business has to know what it will offer to consumers in order to have a competitive advantage. Sometimes this can be as simple as using an online business search. For a fee, there are even companies that provide an environmental assessment for a specific business. ("Becoming an Entrepreneur," 2017)

Ecolab's major abilities stem from the numerous services it provides. As far as its global industry segment, they consist of water treatment, food and beverage, paper and textile care operating segments. Cleaning and sanitizing solutions, primarily to large industrial customers within the manufacturing, food and beverage processing, chemical (industrial/consumer), mining and primary metals, power generation, pulp (soft, wet, mass of material) and paper, and commercial laundry industries. The subsidiary operating segments perform similar manufacturing, distribution, and economic characteristics.

Ecolab's institutional segment consists of specialty and healthcare operating segments. These provide specialized cleaning and sanitizing products to the foodservice, hospitality, lodging, healthcare, government, education and retail industries. This segment's subsidiaries also have similar manufacturing processes, distribution, and economic characteristics.

Ecolab's energy segment, operates mostly under the Nalco Champion name. Nalco deals with the process chemicals and water treatment needs of the global petroleum and petrochemical industries in both upstream and downstream utilizations. Nalco also has a water division under the name of Nalco Water which is important to our knowledge of membrane technology for desalination. Nalco made their name by introducing an alternative to container drums which featured stainless steel units of various sizes that are fully drainable, stackable, and easily re-used. Innovations in technology led Nalco to develop sophisticated diagnostic feed, control and monitoring systems. Nalco Water also has a water pretreatment solution service that involves the production of membranes to clean

water. They have a team of experts that help companies with an assessment of their water cleaning needs from determining the best pretreatment option to maintaining the

membrane. Not only do they produce the membrane, but they also help install and service the ongoing maintenance involved. This service is important to our strategic plan as EcoTeam will be dealing with water cleaning membrane technology for desalination. (“Nalco in North America”)

Ecolab has a long list of resources they have acquired through a horizontal growth method. Its strength is solidified in its diverse array of companies it has acquired. Ecolab has a wider range of diversification than most of their competition. They have acquired many businesses starting in 1987:

Airkem Professional Products Division of Airwick Industries provides floor maintenance and odor control products, mainly for the healthcare market in the form of chemicals and solutions. Key Chemical Company produces specialty chemicals used in the water and wastewater treatment industry for industrial and municipal sectors. Huntington Laboratories produces and markets infection control chemicals in the form of disinfectants and sterilants. GCS Service provides equipment repair and maintenance services for the commercial food industry including cooking and refrigeration. In addition, GCS Service operates as a parts distributor to other repair companies. Henkel-Ecolab makes branded laundry, home care and cosmetic products. Terminix provides pest control solutions in the form of various pesticides. Nigiko is a Paris-based provider of commercial pest elimination services throughout France. Midland Research Laboratories provides water treatment and chemical blending services for cooling towers and other industrial operations. Microtek Medical Holdings designs, manufactures, and markets infection and fluid control products for the healthcare sector. CORPAK is a global medical device company focused on enteral (intestinal feeding tube) access technologies. MedSystems provides health care management

services, comprehensive computerized billing/insurance services, physician accounts management, technical training and practice management/consulting services for physicians and hospitals. Nalco Holding Company is a global provider of water, air, hygiene and energy technologies and services that protect people and vital resources. Champion Technologies manufactures brake and friction products for the automotive industry. Ultrafab designs, manufactures, and sells window and door weather stripping and weather seal products for original equipment manufacturer utilization. Laboratoires Anios designs, manufactures, and markets antimicrobial products for hygiene and disinfection utilization. Abednego Environmental Services helps automotive industry with paint solutions. (Stock Market News,2017)

An environmental assessment wouldn't be complete without looking at the competition. A competitive assessment helps a business recognize the competition when making business decisions. This will help identify your business's strength and weaknesses. These can help identify weakness, point out strengths, and avoid areas of the market where competition is much better at. Ecolab's competition can be viewed on the following table.

Remove	Company Name	Revenues	Gross Margin	Net Income	EBITDA	Total Assets	Total Liabilities	PE Ratio	Market Cap	Employees	Share Price
X	Ecolab Inc	13,152,800,000	47.55	1,229,600,000	2,476,000,000	18,330,200,000	11,429,100,000	-	36,415 M	47,565	124.83
X	Air Products & Chemicals Inc	9,524,400,000	32.78	631,100,000	2,985,900,000	18,055,300,000	10,975,700,000	-	29,427 M	18,300	135.24
X	Clorox Co (The)	5,761,000,000	45.10	648,000,000	1,216,000,000	4,518,000,000	4,221,000,000	-	17,222 M	8,000	134.27
X	Church & Dwight Co Inc	3,493,100,000	45.54	459,000,000	784,100,000	4,354,100,000	2,376,200,000	-	12,622 M	4,500	49.57
X	Fuller (H.B.) Company	2,094,605,000	29.11	124,128,000	270,424,000	2,058,254,000	1,120,378,000	21.2863	2,517 M	4,600	49.81
X	WD-40 Co	380,670,000	56.31	52,628,000	80,285,000	339,668,000	199,273,000	30.8696	1,503 M	445	106.50
X	Ocean Bio-Chem, Inc.	36,205,444	38.32	2,095,171	4,000,449	25,670,642	3,155,571	19.8261	42 M	128	4.56
X	Scott's Liquid Gold, Inc.	35,228,400	43.12	1,854,500	3,672,900	21,833,300	5,591,500	11	20 M	61	1.65
X	Pacific Sands Inc	2,157,592	37.42	(1,332,793)	(968,080)	663,451	1,506,472	-	197 T	12	0.00
X	Green Earth Technologies Inc	766,000	15.93	(8,089,000)	(4,070,000)	11,741,000	28,839,000	-	2,313 T	1	0.01
X	Harvey-Westbury Corp	73,557	37.90	(295,802)	(112,981)	15,110	2,250,330	-	1,153 T	2	0.01

(mergentonline.com)

Church and Dwight make the well-known Arm and Hammer product and they provide businesses and consumers with affordable house cleaning products. The Consumer Domestic segment includes their power brands such as KABOOM cleaning products, ARRID antiperspirant, CLOSE-UP and AIM toothpastes, and SIMPLY SALINE nasal saline moisturizer, to name a few. The Consumer International segment offers personal care products. The Specialty Products segment involves in producing sodium bicarbonate which is used as an antacid. Air Products and Chemicals Inc. produces various industrial gases and chemicals. They are involved in gases such as refining and petrochemical, metals, electronics, and food and beverages. Clorox Co (The) is a manufacturer and marketer of consumer and professional products, consisting of lifestyle, household, cleaning and international brands. The Cleaning segment consists of laundry, home care and professional products marketed and sold in the United States. The Household segment consists of charcoal, cat litter and plastic bags, wraps and container products marketed and sold in the United States. The Lifestyle segment includes food products, water-filtration systems and filters marketed and sold in the United States and all natural personal care products. The International segment covers products sold outside the United States, excluding natural personal care products.

Fuller (H.B.) Company is an American adhesive manufacturing company that supplies adhesives throughout the world. They have a range of specialty adhesives such as thermoplastic, thermoset, reactive, water-based and solvent-based products. WD-40 Co: is a global company involved in developing and selling products, which solve problems in workshops, factories and homes. Famous for their spray solution known by the same name. Ocean Bio-Chem, Inc. manufactures, markets, and distributes appearance, performance, and

maintenance products for the marine, automotive, power sports, recreational vehicle, and outdoor power equipment markets in the United States and Canada. For example, cleaners, solutions, and protectants.

Scott's Liquid Gold, Inc. are involved in the development, manufacture, and trade of household and beauty products. For example, wood cleaners, air fresheners, skin creams, face mask sachets, and dry shampoo. Pacific Sands Inc. develops, manufactures, markets and sells nontoxic, healthy and environmentally friendly liquid, powder cleaning, and water-management products which are based on proprietary blended botanical, nontoxic and natural chemical technologies. Their products consist of water maintenance, pet care and cleaning. (Stock Market News, 2017)

Green Earth Technologies Inc. operates as a green clean tech company. It markets, sells and distributes automotive, marine and residential maintenance and cleaning products for the automotive aftermarket, outdoor power equipment and marine markets. Harvey-Westbury Corp. has been manufacturing, packaging and distributing quality products for the automotive and marine markets, mainly waxes. (Stock Market News,2017)

There are a couple of other companies that deserve to be mentioned that are also in the competitive scope but deal in the agriculture segment and provide chemicals. These are Monsanto, which develops chemicals for the agricultural sector, and Agrium, which also is in the agricultural sector and helps farmers from ground to grower by offering crop nutrients, crop protection products, seed, merchandise and services directly to growers.

EcoTeam mentioned earlier about Ecolab's strengths, including diversification and the array of companies that they have acquired. Analyzing weaknesses is also part of the analyzation process. You can do this by looking at your resources, capabilities, and core

competencies. These must be addressed in order to have a competitive advantage. (Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. ,2017) Ecolab has some weaknesses that include company debt, acquisition budget, and the recent slowdown in oil production. Ecolab's debt has risen from the acquisition of companies mainly Nalco. Ecolab has an annual earnings-per-share growth objective of 15%. Even though it has inflated its debt with Nalco, Ecolab has managed to keep its balance sheet at a healthy investment level. (Ecolab Debt Rises, But Dividend Remains Solid, 2016) Ecolab's budget is somewhat restricted, especially after the Nalco acquisition which cost them \$8 billion. The budget for this venture is \$2.5 billion and we are shooting for less than \$2 billion. The desalination company and solar company should be both around \$1 billion each. Lastly, there is a slowdown in oil production. The introduction of more energy efficient vehicles and more efficient ways of drilling for oil. The Gulf of Mexico deep sea drilling explosion also made it clear that such catastrophes can be expensive for oil companies.

Opportunities are things in the business environment that can be explored in order to gain a competitive advantage. A company of a large size, much like Ecolab, can encounter opportunities on a regular basis. Opportunities can present themselves through many avenues including cultural, political, and economic factors. (Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. ,2017) Our market position allows us to penetrate new markets. Recently we have seen an opening in the water and solar power sector. Due to the fact that we already deal with membranes for water filtration through Nalco, we have narrowed our water efforts toward the desalination industry. The growing demand for green technology and popularity of solar advancement has produced an opportunity to merge desalination with solar. We can take a shape the world approach, with desalination, through an eco-friendly and green way.

For EcoTeam's desalination strategy efforts, we have chosen Hyflux. Hyflux is in the business of water solutions that include desalination, water recycling, wastewater treatment, including membrane bioreactor technology and potable water treatment. The company deals with both municipal and industrial segments. At the Municipal level, they offer a turnkey or design-build-own-operate-transfer operations for water treatment and liquid separation. They also offer the same services for the industrial sector for the pharmaceutical, biotechnology, food processing and petrochemical oil-related industries. Their niche membrane technology is what has gotten EcoTeam's attention and made it a viable choice for their strategy and they are within EcoLabs budget. Hyflux happens to have a standard cycle where development of new filtration takes moderate time and is moderately costly along with installation of small transportable units. Hyflux is based out of Singapore and their competitors include Pan Asian Holdings Ltd., Manila Water Co. Inc., China Everbright Water Ltd., and SIIC Environmental Holdings Ltd.

Pan Asian Holdings Ltd. provides pipe services infrastructure in the water industry. These pipes connect raw water to water purification plants and then distribute the clean water to industries and homes and is headquartered in Singapore. Manila Water Co. Inc. is a fairly new company, founded in 1997, that provides services in water, sewerage, sanitation, distribution, pipework, and management services that operates through The East Zone Head Office and Management Contract segments and is headquartered in Singapore. China Everbright Water Ltd. is another new company founded in 2014. It's headquartered in Shenzhen, China and provides wastewater treatment, reusable water, waste water heat pump, sludge treatment, and R&D of water technologies, engineering and construction for mostly municipalities. SIIC Environmental Holdings Ltd. is fairly new,

founded in 2002, and based out of Singapore. They provide water and solid waste treatment and also construct treatment infrastructure. (Stock Market News,2017)

Market commonality is going to be an issue in markets such as China, Middle East, United States, and East Asia. In China desalination is fairly new. The big desalination project builders are BEFESA, Hyflux, Aqualyng, IDE, Zhonghe and Tsingtao Huaou. The biggest obstacle to growth in China, decreased supplier power, which has to do with the financing for desalination suppliers of these massive projects. Furthermore, the government doesn't provide any incentives. BEFESA and IDE have made the two largest operating desalination plants. The most popular technology used is Reverse Osmosis even though it has some problems with membrane blockages. (Jennie Peng, n.d.) The Middle East is home to the largest thermal and membrane desalination plant in the world. Saudi Arabia, the United Emirates, Kuwait, and Bahrain contains 70% of the world's desalination plants. (Alexandra Barton, n.d.) The United States leads the world in research and technology behind ecofriendly desalination. The introduction of long-term bond financing, much like Israel, Singapore, and Australia, has made it easier for large scale projects to be a reality. (John B. Tonner, n.d.)

For EcoLab's solar power strategy efforts EcoTeam has chosen Narenco. Narenco is a fairly new company that was established in 2009, and is headquartered in North Carolina. It has 65 facilities in the Southeast region and still growing. They collect power using photovoltaic panels. These panels collect light (photo) and directly turns it into electricity (voltaic). These panels are sized to collect 80 megawatts AC (alternating current). To put it in perspective, one megawatt can cleanly power 200 homes. (NARENCO constructing new solar projects in Orangeburg County, 2017) Solar energy has been around

for more than thirty years. Not only are consumers and businesses looking to it for their power needs, but also government municipalities. It isn't uncommon to see road signs, cameras, and road construction signs being powered by solar panels. The growing trend has brought about some competition in the United States. Some of these companies include Verengo Solar, SolarCity, Sungevity, Sunpower, and Sunrun. Verengo Solar has become one of the top choices for residential solar power. In fact, it's doing so well that it has been welcoming buyers. With more than 12,000 solar installations, it is a top competitor. It is also known to be a friendly service for residential and commercial solar enthusiasts. SolarCity also is a major residential installer, but also is a manufacturer of panels. They also work with nonprofit and government sectors and offer leasing and PPA programs while specially manufacturing orders to fit. Leasing options help make it a strong competitor for businesses and residential customers. Sungevity is known as a pioneer in the solar industry. They offer leasing and financing options and have satellite distribution and installation companies that operate under their brand logo. Their leasing options have made them a viable choice for the residential, PPA and business segments. Sunpower specializes in solar cell and module manufacturing and solar equipment installer. Their main focus was residential but has expanded into the commercial and government sector. They cover a wide array of projects that range from small DIY projects to industrial projects. Sunrun is a newer company to the solar industry but has quickly become the largest installer in the eleven states it operates in. Even though they do not manufacture solar panels, they are specialists in installation and leasing. They offer services for residential, government, and industrial contracts. They have attracted newcomers to the solar energy market along with PPA segments. (Rinkesh, 2016)

With their value-creating diversification, Ecolab is set to be a leader in clean energy water desalination. Their I/O (industrial approach) has made them a worldwide success so far in many segments that it operates behind the scenes. EcoTeam is optimistic in the future strategic endeavors they have proposed for EcoLab.

MARKETING SECTION

POSITIONING

Ecolab is a B-to-B, global industrial organization that is oriented toward industrial processes. They have positioned themselves as a sustainable, innovative and customer-oriented brand. They are the leading company out of all their competitors and take pride in their position in the marketplace. Ecolab is a company that wants to project how much they genuinely care about people. CEO Elliot Clark of SharedXpertise and CR Magazine describes Ecolab as a company that "...embodies the concept of doing well by doing good. Their business is, in short, to make every company a cleaner, healthier and more sustainable operation." Whether it's their clients or the people who benefit from their products, they want to be considered an ethical, thoughtful brand. (Clark) Exceptional service is not simply a piece of Ecolab, but a core competency that they have excelled at. In a Forbes article from 2014, CIO of Ecolab, Stewart McCutcheon, discusses the role of technology is a key for providing the best service. He goes on to say how it provides a value to clients and helps Ecolab meet needs efficiently. He says, "We strive to be the highest value option in the marketplace." (High) Further in the article, he states that Ecolab encourages their associates to go out in the field with clients to see how their technology actively works and see what opportunities and improvements can be observed. After the acquisition of Nalco, Ecolab surveyed their customers and realized customer satisfaction wasn't optimal, around 60%. They decided to implement a team that focused on increasing this satisfaction rate to their goal percentage of 80%. They were able to achieve 77% satisfaction at the time and today Ecolab is running at an impressive 93%. (High) Ecolab's customer-oriented view should be

considered remarkable for such a large, profitable company, but they consider it to be a critical part of their process, which may explain their success.

Ecolab has been named one of the most ethical companies for the past decade by the Ethisphere Institute. The institute's list names companies who "exemplify transparency, integrity, ethics and compliance in their business practices." (Business Wire) Ecolab has positioned themselves as a brand who innovates and creates for the safety of the public. "Our products and services prevent disease and infection. Keep food supplies safe. Protect the places where people eat, sleep, work, play, and heal. We touch what is fundamental to quality of life: We keep people healthy. We enhance well-being. We provide assurance, so life can be lived fully." (Ecolab) Ecolab only uses suppliers with safe workplace and labor policies. Ecolab is a company that is adamant about their ethical standards and sets the bar incredibly high for competitors.

Ecolab prides itself in its efforts to be sustainable. They even put out annual sustainability reports to showcase how they helped clients conserve and save. In 2015, they helped clients conserve 142 billion gallons of water and save 10 trillion BTUs of energy. By 2020, Ecolab wants to reduce water withdrawal by 25% and greenhouse gases by 10%. By 2030, they want to conserve 300 billion gallons of water just from their own operations. (Ecolab) The idea of being a sustainable company also ties in with Ecolab's other values. Their sustainable acts are ethically sound and are actually saving their customers resources and money.

Any large, successful company in the modern era needs innovation. A business cannot keep up with competition and hold the interest of consumers without it. Ecolab understands this and holds themselves to a high standard in terms of innovation. They

intentionally work on building teams of innovators; intelligent, creative problem-solvers. Ecolab considers the hiring process to be the starting place for innovation. They also consider their problem-solving efforts and exceptional relationships with clients to be a main focus for innovation. Larry Berger, Ecolab's CTO, says, "We look to solve problems [and] create value for our customers. We are tenacious in demonstrating that, working collaboratively with customers and finding ways to scale our technology. We have a strong mindset around trying to demonstrate value creation. We spend a lot of time in our customers' locations working in partnership with them to do that. That is a big part of how we innovate." (Ecolab) One of the ways Ecolab has differentiated themselves is through their customized technologies and solutions. They have moved themselves from just "buying and applying" technologies, to creating their own. Stewart McCutcheon says, we tend to develop more of our own solutions; it is differentiated business to business and not one size fits all... because of the diversity in our business, we have to have the ability to develop unique solutions in those markets, especially the closer we get to the customer." (High) This connects back to their customer-oriented view. Ecolab uses innovation not just to elevate their company, but also to meet customer's needs.

MARKETING STRATEGIES

ESTABLISH LEADERSHIP IN DESALINATION

One strategy EcoTeam recommends is that Ecolab establishes themselves as the leader in desalination. Ecolab is already one of the best of their industry and they should pursue the desalination strategy with this in mind. CTO Larry Berger stated, “We like to set the industry standard, enabling our customers to run their businesses better with high-impact, reliable and embedded solutions.” (Lawler) And that’s the idea that Ecolab should maintain moving forward, continuing to be the industry standard for desalination.

When the H1N1 virus spread worldwide and affected thousands of people, Ecolab felt compelled to play their part. The Quarterly Insignia describes Larry Berger’s role in organizing Ecolab to “educate its 1.3 million customers worldwide about the right disinfectants and sanitizers to buy and the proper way to use them to combat the H1N1 strain (aka swine flu) in such public facilities as restaurants, hotels, schools, hospitals and industrial plants.” (Lawler) It goes on to state how Ecolab discovered their role in global pandemics. “Right from the start, Berger realized how quickly a crisis can arise and how nimbly Ecolab would have to respond, providing a steady stream of information and educational seminars, as well as supplying products and services to mitigate the flu outbreak.” (Lawler) It is recommended that Ecolab use these ideas to create a similar strategy to establish themselves as desalination leaders.

Ecolab should make sure to tell their story. Their growth strategies are not only to buy a desalination company, but also to buy a solar energy company and use it to power the desalination plant. And they should share this process with the world. Ecolab can create a campaign called The Desalination Solution to educate the customers and the public across

several channels. They should explain the problem of depletion of water sources, their innovative solutions and the desalination processes they will perform. Ecolab can publish their own work or get their work published in prominent magazines and on well-known websites/blogs. They can create a series for their YouTube channel that is dedicated just to the Desalination Solution. They can conduct educational seminars like what they did for the H1N1 virus. It's important for Ecolab to create a consistent, informative campaign that will not only educate the public, but also establish themselves as front-runners in desalination technology.

An important piece of educating the public is trust and luckily, Ecolab values have established them as a trustworthy company. Andreas Eisingerich and Simon Bell of Sloan Review were quoted in a Forbes article saying, "Efforts to enhance customers' service knowledge and provide them with the skills and abilities to use critical information can help companies differentiate their service offerings and provide a strong foundation on which to build trusting relationships with customers."(Craig) While Ecolab's efforts should discuss and display their solutions, it shouldn't come off as a sales pitch of their products, it may come off as disingenuous. The idea of educating the public on the growing scarcity of water aligns with Ecolab's ideals of being a safe, ethical company. They want the best planet for all 7 billion people, so an ideal way to start is with education.

CUSTOMER RELATIONSHIPS

An important component of any acquisition is making sure both companies are aligned. Hyflux and Narencos both have consistent values as Ecolab. Hyflux and Narencos are both innovative companies that work hard for the customers they serve. Hyflux is an award-winning company that believes in sustainability as much as Ecolab. Narencos, though smaller

in size, was able to bring a renewable energy source to their home state. Both Hyflux and Narencos share Ecolab's vision of a healthier, sustainable world and through these shared interests, a smooth acquisition will be able to occur. Another strategy that EcoTeam recommends for Ecolab is to use these acquisitions to create lasting relationships with the new customers they would obtain.

By acquiring both Hyflux and Narencos, Ecolab is expanding their client base. They will be able to use these new channels to build lasting relationships. One of Ecolab's main values is their customer-oriented solutions and exceptional service; it's very important to maintain this through these newly purchased companies. While Narencos is in North Carolina, Hyflux is based in Singapore and has clients, so that may create some challenges because of cultural differences. The first step for fostering these new relationships is to conduct research. Ecolab should conduct ethnographic research as well as conduct interviews and surveys with new customers to find out more about who they are, what their needs are, how they like to conduct business and what can be improved. It's important that Ecolab works to maintain clients through the acquisition before focusing on obtaining new ones. In a study conducted on relationship marketing, it states, "Gratitude here is the key factor that enhances the quality of relation on one hand and obtains positive outcome for the seller on the other. Customers will never leave the organization if they are kept happy. This necessitates monitoring of some factors like availability of substitutes, customer satisfaction, trust and quality of services offered (Theron and Terblanche, 2010)." (Chung Lo) So this furthers the notion that Ecolab should make sure to be checking in with the new customers and making sure they are comfortable with the acquisition.

Ecolab can mimic what they did after the Nalco acquisition and measure customer satisfaction. If necessary, they can create another team dedicated to increasing customer satisfaction. In the same study, the authors go on to say, “Studies on this have suggested that there exists positive correlation between customer satisfaction and profitability baselines. This has also become the driving factor in the stock markets (Grewal et al., 2010).” (Chung Lo) Again, furthering the idea that satisfactory customer relationships are necessary, especially for the bottom line.

SELLING HYFLUX AND NARENCO PRODUCTS

Through these new acquisitions, there are also new opportunities created for selling products. Now that Ecolab owns Hyflux and Narencos, they can sell both of these companies' products to new or existing customers. EcoTeam recommends that Hyflux's larger systems be sold to the government and smaller, plug-in systems be sold to businesses in industries like hospitality or manufacturing. Narencos' products can be marketed and sold to existing clients in need of solar technologies.

The government is one of the largest buyers of goods and services and spend billions a year purchasing from companies. There are also initiative and executive orders in place that require the US government to purchase environmentally conscious goods. (EPA) It would be ideal to create a working relationship with the government so that Ecolab could supply them with Hyflux's desalination technologies. After winning a bid for a contract and defining what services they would be able to provide, Ecolab would be utilizing their newly acquired resources to attain a powerful customer. Hotels and resorts can benefit from the smaller models of desalination equipment, especially for locations that need clean water. Ecolab has clients who are hotels, like Marriot, whom they would be able to start marketing these products to. Ecolab would also be able to expand their humanitarian efforts by selling products like the Floating Desalination Production Vessel, a boat that is able to bring clean water anywhere. EcoTeam recommends that Ecolab utilize these existing relationships and innovative technologies to increase sales and fully integrate Hyflux and Narencos products into their company.

GROWTH STRATEGY 1: DESALINATION

An increasing global population and decreasing reserves of freshwater threaten to become a major economic and social challenge in the coming decades. According to the World Resources Institute, water consumption is predicted to increase by 18% in developed nations, and a staggering 50% in developing countries between 2007 and 2025; twice the rate of global population growth (Zabarenko). This is due to an increase in standards of living, and corresponding increased levels of consumption, in rapidly industrializing nations and regions across the globe. The prime culprit for rapid depletion of water sources is agriculture, which constitutes 69% of global consumption, next being industrial use at 19%, followed by municipal consumption at 12% (Schlosser). As nations develop, per capita water demand for all the above increase: more meat is eaten which requires dozens to hundreds of times its yield weight in animal feed crops, increased purchases of manufactured goods stoke industrial demand, and the various musts of civilized society (hygiene, landscape maintenance, upkeep of essential services) take the rest.

Thankfully Ecolab is at the forefront of water consumption reduction. Since acquiring Nalco Water in 2011, it has become a world leader in industrial water supply and treatment solutions and products for industries, including but not limited to: chemical processing, food and beverage processing, manufacturing, mining and mineral processes, power generation, primary minerals, as well as pulp and paper. For water supply and storage, Nalco produces pump systems, holding tanks and forced filtration systems which utilize a wide range of filtration media. Internal industrial applications include treatment of boiler water and coolant water, disinfection, and anti-foam and particle reduction for boosted process efficacy. Finally, and perhaps most importantly from an environmental perspective, Nalco markets

comprehensive waste filtration and disposal systems for water leaving industrial use. Since their introduction, Nalco technologies have saved more than 650 billion gallons of water, equivalent to the annual drinking water needs of 2.2 billion people (Nalco).

Given Ecolab's global competencies in water treatment, and worldwide need for fresh water on the rise, the firm stands to benefit strategically and financially from diversification into a process which pairs prowess in treatment processes, with mass water supply.

Desalination, the extraction of minerals from seawater for both municipal and industrial use, constitutes a natural strategic fit for Ecolab and Nalco. Desalination is primarily accomplished by two methods: Thermal Technologies, which use negative pressure or heat to boil water and leave impurities behind, and Membrane Technologies, which force water through semipermeable filtration membranes by means of positive pressure (Krishna). As Ecolab and Nalco possess a higher degree of experience with filtration methods and products, a focus on membrane osmosis would likely prove to be better aligned with current capabilities. Membrane osmosis also boasts the added benefit of decreased energy consumption per gallon compared to thermal methods.

In order to understand global demand for desalination, a brief survey is necessary. The Middle East currently the largest and fastest growing market for desalination, with Saudi Arabia and the UAE as the first and second highest capacity operators respectively (Levin). This is due to a concentration of highly urbanized, coastal populations with virtually no access to natural water sources. Demand for desalination has increased at around 10% annually, with an expected increased capacity of 39 million cubic meters per day, requiring more than \$50 billion to be invested in additional facilities (Terblanche). The United States is the world's 4th largest operator of desalination plants, and the market continues to grow. Due

to aquaporin depletion, and increasing demands on existing groundwater sources, and growing populations, the demand for alternative water sources has increased. This is particularly true in semi-arid coastal states such as California, Florida, and Texas. This demand is reflected in the boom in new construction, with 117 of the 324 municipal desalination plants built since 1971 brought online between 2000 and 2010 (Levin).

The next major decision was how to best enter the industry. The first option would be to harness Nalco's existing expertise and off the shelf technologies to develop and construct desalination facilities. While attractive in theory, the prospect is likely folly. Even though Nalco's products and services are similar in purpose and sometimes function, the majority of membrane desalination technology would need to be developed, licensed, or purchased outright. Additionally, Ecolab's full line of products and services are marketed as components installed in new or existing industrial concerns. While Ecolab has built and does operate manufacturing plants, the process of designing, building, and administering a desalination plant from whole cloth would likely be needlessly inefficient and expensive. These concerns in mind the best option is to purchase an existing desalination firm, a move in keeping with Ecolab's core I/O strategy of diversified acquisition and corporate integration. Acquiring an established firm will give Ecolab both the technology, human expertise, and capability to build new desalination plants, and revenue streams from the target firm's existing operations.

From the above, EcoTeam established criteria for the ideal company for acquisition. First, the firm must specialize in the manufacture and operation of industrial and utility scale membrane based desalination systems. The focus on membrane technologies is a must; the majority of Nalco's research and development hinges on filtration and filtration support

technologies, allowing for better fit to existing competencies, and cross functional synergy in the development and improvement of future systems. The target firm should also offer diversified product lines for commercial, industrial, and municipal scale operations ready for immediate sale and installation. Second, it must have a proven record of installation and success of systems in locations around the world. The ability to bid and compete successfully in all markets allows for a wider potential market, the ability to compete effectively with major international players, and to shift focus where the best opportunities are present. Third, the acquisition should carry a total cost of no more than one billion dollars. Additional significant debt financing would likely increase Ecolab's debt ratio above 2.0x, and threaten its current Baa1 Moody's credit rating (Global). Finally, the target company would ideally be independently owned and operated. This criterion arose later in our research, when it became clear that the majority of major desalination companies were either wholly or majority owned by much larger competing industrial conglomerates, such as General Electric, Israel's Dalek Group, and South Korea's Doosan Group (Nanalyze).

After an intensive evaluation of acquisition candidates, one became apparent as a clear frontrunner, meeting nearly all of EcoTeam's established criteria. Hyflux is a Singapore based firm specializing in membrane desalination and water treatment technologies, with a developing secondary competency in power generation. Hyflux's most basic products are the rugged proprietary Krystal® Polymeric Ultrafiltration Membrane (used for desalination and basic water treatment) and FerroCep® Stainless Steel Membranes (used for the removal of especially pernicious chemicals from industrial water), both designed and manufactured at Hyflux's facilities in Singapore (CITE). Another area of particular interest are Hyflux's line of plug and play membrane filtration systems for industrial facilities and small

municipalities. Finally, Hyflux is an expert in the design, construction and operation a wide range of large scale facilities. Most notable is their flagship Tuaspring Integrated Water and Power Plant, with a daily output of 318,500 cubic meters of water and 411 megawatts of electric power. The successful integration of these products and facilities will cement Ecolab as a global player in the desalination industry(CITE).

Effective integration of Hyflux's assets in order to generate the best business outcomes and highest profits will require multiple business level strategies. Hyflux's membrane technologies, most notably Krystal® and FerroCep® lines, have been installed in more than 400 locations around the globe, and have proven to be a popular option for primary water treatment. These membranes can be marketed in a similar manner to filter technologies offered by Nalco. Industries which currently utilize Nalco membranes for other purposes can likely be targeted as customers for these new product lines. Ecolab/Nalco sales and technical representatives who work closely with these firms should seek opportunities for the effective sale and integration of Hyflux membrane products in relevant applications. An audit should also be conducted on the manufacturing and distribution arms of both businesses. All possible measures should be taken to eliminate redundancies and combine production resources when possible, while being careful not to sacrifice the quality of either business unit's offering. Similarly, distribution and logistics for Hyflux membranes should be integrated into Ecolab's supply chain process to best lower costs and reduce inefficiency.

Hyflux also produces four modular desalination and water treatment systems which are delivered and housed in standard shipping containers, each with a range of available predesigned sizes: The Standard Membrane System, a scalable 'budget' desalination and water treatment system which sports the lowest unit cost and lead time (84-

9000m³/day); the PoroCep® bioreactor system, a compact, energy-efficient, plug and play model which utilizes microbial action in treatment (100-3000m³/day); the Ultrapure system, a built to specification model for industrial applications with specialized requirements for particle reduction; and possibly most interesting the Floating Desalination Production Vessel, a large boat designed around a desalination plant for use in maritime applications and disaster relief. EcoTeam recommends that Ecolab should conduct an engineering review on these systems to establish if existing Nalco technologies and materials could be incorporated to make them more cost effective. Barring the discovery of major cost reductions or increases in quality, most of these systems can likely be marketed as-is, while incorporating Ecolab and Nalco R&D advances where applicable. With this in mind Ultrapure system should be evaluated for overall strategic fit, as it is designed for specialty industrial water treatment, which is Nalco's core competency. Ecolab should weigh the value proposition and benefits of the Ultrapure system against those of comparable systems offered by Nalco. Unless if this product line does not offer significant financial advantages for Ecolab over existing Nalco offerings, it will likely be discontinued. As with membrane technologies, all possible measures should be taken to find and integrate manufacturing, technology, and operational synergies, while seeking not to compromise the service and product quality for which Hyflux is known. Given that these systems are compact, energy efficient, and more likely to be deployed away from centralized infrastructure, pairing them with NARENCO solar energy farms could prove an attractive and lucrative option.

The most difficult task facing Ecolab will likely be integrating Hyflux's large plant construction and operation elements. While Ecolab and Nalco install and provide service to a diverse range of industrial water treatment systems, they have never done so on such a large

scale as Hyflux's seven major desalination plants (four in Singapore, two in Algeria, and one in China). It should also be noted that in addition to the seven large desalination plants, Hyflux currently owns and operates a 411MW natural gas plant at its Tuaspring facility, and is in the process of constructing Singapore's largest waste to energy plant, which it will own and operate for two decades (National Environmental Agency). This is the area of the acquisition where close cooperation with, and a high degree of trust in Hyflux and its staff is essential. Ecolab should be mindful of the fact that Hyflux's home country plants supply more than a quarter of the nation's freshwater. The Tuaspring and SingSpring plants are also points of national pride, both having won "Desalination Plant of the Year" at the Global Water Awards in 2014 and 2006 respectively (Hyflux, 2017). It is easy to address the filter and system lines previously discussed as products from a marketing and technical standpoint. However, when regarding the core business of large plants, especially those which provide the literal lifeblood of Singapore, we must pause for serious reflection on Hyflux's human element. With this in mind, no human is more important than Hyflux's founder, president, and current CEO, Olivia Lum.

Lum was born in the late 1960's in Malaysia, and raised adoptive 'grandmother', who's compulsive gambling habit resulted in her upbringing in extreme poverty. In a telling anecdote, Lum recalled her least favorite chore of drawing water from a local well and carrying it home in buckets, which she always managed to spill (Hayakawa). Lum moved to Singapore at the age of 15 to study, and worked various jobs while earning her honors degree in chemistry from the prestigious National University of Singapore. After graduation she was employed as a chemist at Glaxo Pharmaceutical in a department which disposed medical wastewater at considerable expense. Seeing a potentially burgeoning market, she founded

Hydrochem in 1989 with \$20,000 generated from the sale of her car and apartment. Olivia, and a team of three chemists went directly to businesses by motorcycle, without any existing connections. She treatment chemicals of their own design, and eventually won contracts market water treatment systems made by major firms. Hyflux was the first water treatment company to be listed on the Singapore Stock Exchange in 2001, followed by meteoric average growth of 30 percent annually, owing largely to the construction of most major plants in this time. In 2007 Hyflux Water Trust became the first pure-play water treatment company listed on the SSE main board. From 2003-2005 Ms. Lum served as a nominated member of Singapore's parliament and according to an interview in Leaders Online, Ms. Lum is "a member of the Singapore-Tianjin Economic & Trade Council and the Singapore-Jiangsu Cooperation Council, as well as the President of the Singapore Compact for Corporate Social Responsibility. Lum has been recognized as Winner of the Regional Growth Award by Nihon Keizai Shimbun at the 11th Nikkei Asia Prize 2006 and was most recently chosen as the Ernst & Young World Entrepreneur of the Year 2011." (Leaders Online, 2015) Various sources place her net worth between \$300 and \$450 million.

In Olivia Lum, Ecolab could either find its greatest ally, or staunchest opponent in the acquisition of Hyflux. On the one hand, Ms. Lum is a self-made woman, and by her own intelligence and acumen she has risen from a village in Malaysia to one of Southeast Asia's most respected and wealthy businesspeople. The motivation and vision behind her business stems from deeply held personal beliefs about universal access to potable water. Finally, her company has become an essential element of life in Singapore, and her professional and philanthropic commitments speak volumes about her commitment to her nation and people. All this considered, more callous conglomerate would likely find a difficult prospect in

courting Ms. Lum for control of Hyflux. Thankfully, Ecolab has demonstrated a clear track record of environmentally sustainable business practices, and has been consistently listed by Ethisphere among the world's most ethical companies (Business Wire). With its acquisition of Nalco it is also a global leader in innovative water treatment research. This acquisition should be couched and executed as an ongoing effort to expand on Hyflux's mission of delivering quality potable water with the broadest possible scope, and greatest impact on the lives of those who it serves. If Ecolab can craft a strategy around these principles, and be granted approval by Ms. Lum, they might best be served in keeping her in charge for the foreseeable future, as to ensure continuity of leadership and strategic direction. Potential leverage might also be found in Hyflux's growth plateau in recent years, struggle to turn a profit alone at current scale. Ecolab possesses the depth of resources and global reach to spur greater expansion, which will be elaborated upon in the finance section.

Finally, we arrive at large plant construction and operation, which is best described in Olivia Lum's own words: "We approach projects in a couple of ways: one is through Build-Own-Transfer (BOT) or Public-Private-Partnership (PPP), where we design, build, test and commission, operate, and maintain the project, in addition to arranging for project financing. For such projects, we have a water purchase agreement with the main off-taker, such as the municipal government, to provide water over a long-term concession period of some 20 to 30 years. Some projects involve just engineering, procurement, and construction (EPC) works, and this is where we provide turnkey project management to ensure that the plant is completed on schedule, within budget, and meets the customer's specifications. For such projects, we hand over the plant to the owner upon testing and commissioning." (Leaders Online) A clear delineation should be made between engineering and building plants, versus

additionally owning and operating them. Ecolab and Nalco will likely be able to provide worthwhile input on filters and self-contained systems, and can quickly gain competence in operating plants, which is a similar function to their industrial water service competencies. However, large scale desalination projects are outside the purview of both ventures. Hyflux's experience and competency in engineering, bidding, and constructing large scale desalination (and secondarily power) plants is the prime strategic reason Ecolab is better served buying the firm than developing in house capabilities.

Upon a successful acquisition, Ecolab should make a careful study of Hyflux's existing plants, and projects under development. It should take the greatest possible care to dispatch personnel to Hyflux with relevant technical, language, and most critically, people skills. During the initial years following acquisition Ecolab representatives would be best served by working closely enough with Hyflux employees and engineers to understand construction and operation, without impeding regular operations or causing major upsets in corporate culture. Hyflux's plants are renowned for quality and efficiency thanks to the talents of their designers and engineers, and these seasoned professionals should be allowed the freedom to make the decisions which they deem best. Thankfully, Ecolab boasts a storied history as a global acquirer and integrator of firms in a diverse array of industries, and has demonstrated the ability to allow business units' leeway to best capitalize on their unique capabilities. With operations in 170 countries, and strong existing relationships with the major industrial firms therein, Ecolab will likely find a competitive edge in gauging demand and finding opportunities for future Hyflux projects (Ecolab). While Ecolab will be directly responsible in locating and facilitating new large scale opportunities, as well as ensuring

strategic decisions geared toward profit, Hyflux should be at liberty to execute their core competencies to the best of their considerable abilities.

The acquisition of Hyflux will be accompanied by relations with an assortment of new stakeholders and strategically necessary partnerships. First, as a major project manager and developer, Hyflux partners with, and bids out a large volume of work to, local and international construction and materials companies. These relationships will require relatively close scrutiny on the part of Ecolab in order to prevent the possibility of noncompetitive bidding and overly close collusion. This is especially true partners like the notorious keiretsu Mitsubishi Heavy Industries, with whom they formed a consortium to construct the Tuva waste to energy plant. Another region with the potential for abusive or crooked business practices is the Middle East and North Africa, where Hyflux operates two plants in Algeria and is constructing a 200,000 m³ plant for the Sultanate of Oman, and is under contract by the Saline Water Conversion Corporation to supply containerized units for the Kingdom of Saudi Arabia. Similarly, operations in mainland China must be screened for potential bribery or labor issues. EcoTeam still strongly encourages Ecolab to allow Hyflux the highest possible level of autonomy in choosing suppliers and clients, but cautions them to ensure above-board business practices in all levels of Hyflux's contracting and supply chain.

GROWTH STRATEGY 2: INDUSTRIAL SOLAR ENERGY

NARENCO

Our second strategy is the acquisition of National Renewable Energy Corporation (NARENCO), an American solar energy company, based in Charlotte, North Carolina. NARENCO sites, develops, finances, constructs, owns, and operates utility scale solar facilities. It was founded in 2009, focusing on providing engineering, procurement, and construction services to strategic partners, third parties, and regulated utilities. In 2015, they were ranked as North Carolina's number 3 installed solar EPC (engineering, procurement, and construction) company and number 6 US solar developer, and additionally was named one of the best places to work in Charlotte. NARENCO has constructed over 100 megawatts of solar projects and another 100 megawatts under contracts. The company secures sites to develop solar fields, then earns returns through interconnection and a power purchase agreement with the governing utility. In January 2014, they partnered up with Canadian Solar to supply 25.3 megawatts of photovoltaic resources to a residential solar provider in North Carolina, delivering over 80,000 modules. In 2016, NARENCO invested \$85 million in Allendale county, South Carolina, supplying to about 1,000 local residential homes by building two new solar farms. NARENCO owns 392 acres in total throughout the United States (National Renewable Energy Corporation, 2017).

It is currently on the market for \$20.5 million and has a 45% growth within the unique solar and solar/hybrid and dist. product line. NARENCO specializes in the manufacturing, selling, and servicing its patented solar, wind, and hybrid products. They provide their services to commercial, industrial, and government entities; which include contracts with The Pentagon, Department of Defense, and Department of Homeland

Security. There are other customers that are nationally known rental companies and Fortune 500 companies, who are interested in buying products that can minimize their carbon footprint and add to their bottom line. The company has expanded internationally and established a presence in Canada, Mexico, and Australia. The 2015 sales increase more than 45% growth rate, and had a cash flow of 1.5 million in 2016. The company currently has a gross revenue of \$44.5 million, a cash flow of \$5.5 million, and an inventory of \$1.8 million (Unique Solar and Solar/Hybrid and Dist Product line with 45% GROWTH, 2017).

SOLAR ENERGY

Solar energy is energy from the sun that is converted into thermal or electrical energy. It is the cleanest and most abundant renewable energy source available, and the United States has some of the richest solar resources in the world. With advancement in technology, the energy can be harnessed for a variety of uses, including generating electricity, providing light, and heating water. The solar energy industry is currently working to scale up the production of solar technology and drive down manufacturing and installation costs. There are several ways to harness solar energy, which include photovoltaics, solar heating and cooling, concentrating solar power, and passive solar. Photovoltaics, solar heating and cooling, and concentrating solar power are active solar systems which use mechanical or electronic devices that convert the sun's heat or light to another form of usable energy. Passive solar buildings are designed and oriented to collect, store, and distribute the heat energy from sunlight to maintain the comfort of the occupants without the use of moving parts or electronics (Solar Energy, 2017).

The need for solar energy has been increasing over the years and the renewable energy industry has been skyrocketing. The use of solar energy has many environmental and economic benefits. It is good for the environment, being that solar energy does not produce harmful emissions and it is all natural by using the sun as its only resource. Transitioning to solar energy is expensive for the installment, but it will decrease the cost for energy per year and property tax will not increase in most states. Solar energy systems are durable by the fact that it has no moving parts, and can withstand extreme weather conditions. It can be used all day even if the sun is not out due to weather conditions. The systems will still be working to produce energy because all the energy that is absorbed when the sun is up produces more

electricity than you can use (Weber, 2016). The transition to solar energy will help reduce the dependence on fossil fuels and bring awareness to the harmful effects of fossil fuels compared to the benefits of solar energy (E, 2017).

USING SOLAR ENERGY WITH DESALINATION

We plan on incorporating solar energy with our desalination strategy, because thermal energy is used in the process. Being that desalination needs are mainly in dry countries receiving huge intensity of solar radiation, it comes as an evidence to use solar power for the running of the plants. The two solar technologies that can be used for desalination are concentrating solar power and photovoltaic technology. Some concentrating solar power technologies are parabolic trough, linear Fresnel reflector systems, and central tower receiver. These technologies concentrate solar radiation onto an absorptive pipe, the receiver, which contains heat transfer fluid (water, oil or salt). Concentrating solar power systems generate power using a steam-driven turbine. Photovoltaic technology has been developed as flat-plate PV module, which is most commonly used, and a developing concentrating photovoltaic technology (Compain, 2012).

Parabolic troughs produce steam and electricity through the use of a parabolic surface that concentrates direct normal solar radiation onto a receiving tube surrounding by a glass element. Thermal fluid is transferred through the receiving tube where it is heated and then used as heating fluid to the power plant for generation of high-pressure steam. Parabolic trough is the most developed of the concentrated solar power technologies and is available for industrial heat production purposes. Photovoltaic panels generate electrical power through the use of semiconductors. Flat-plate module is the most efficient photovoltaic technology, with a core composed of mono or polycrystalline silicon cells. The cells absorb both direct and indirect solar radiation, which induces an electric current. The panels are interconnected into a circuit to convert the direct current into an alternating current for the grid (Compain, 2012).

When bringing solar energy and desalination together, it can result in many combinations. Photovoltaic electricity can be used with reverse osmosis, which is the most common way to convert DC from photovoltaic panels through an inverter to produce AC immediately used in pumps. Some developments anyway were done on connecting panels to a brushless DC motor, power a low-pressure pump, allowing direct use from photovoltaic panel to pump. The multi stage flash process as a thermal process can also use solar power with parabolic troughs. The steam produced by parabolic troughs is used as a heat source for the multi stage flash inlet (Compain, 2012). By using solar energy, desalination plants can act as a sink rather than a course of atmospheric carbon dioxide and help neutralize ocean acidity. Lowering the energy required to dewater brine prior to decomposition would be a major environmental benefit. The use of solar energy is potentially very attractive, because not much energy is needed to decompose magnesium chloride in brine to magnesium oxide (Aston University, 2015).

GLOBAL SOLAR ENERGY INDUSTRY

China is the world's largest market for both photovoltaics and solar thermal energy. They have been the world's leading installer of solar photovoltaics. It is a growing industry in China with over 400 companies. By the end of 2016, the total photovoltaic capacity increased over 77.4 gigawatts (Reuters, 2017). In 2014, China had a total installed capacity of 290 GWth of solar water heating, representing about 70% of the world's total installed solar thermal capacity (Mauthner, 2016). According to the European Photovoltaic Industry Association, the total installed capacity could grow between 47 gigawatts to 66 gigawatts by 2017 (EPIA, 2017). China has been the world's largest manufacturer of solar panels since 2008 and produced the majority of global photovoltaics on an annualized basis since 2011 (Earth Policy Institute, 2013).

The Middle East is a good market to enter because of the weather conditions of the sun being out for so long and the absence of rain. Dubai, the most populated city in the United Arab Emirates, is planning on building the world's largest solar plant and is expected to meet a quarter of the city's national energy needs by 2020. By 2050, they plan on being 75 percent renewable, which is a big deal in a region with an abundant amount of oil and money. They plan on using concentrated solar which is where a massive array of mirrors reflect light towards a central point. At the point is a tower, where the light is focused, and power is generated by the heat from all the light powering a steam turbine. This method is perfect for a region that is hot and gets a lot of sunlight, similar to how Denmark depends on wind (Whittaker, 2016). We can be able to put our foot into the Middle East by providing the construction and service of concentrated solar power plants.

SOLAR ENERGY INTERNATIONAL/DOMESTIC EXPANSION

We want Ecolab to expand NARENCO internationally after acquisition, first expanding to one region of the Middle East. The company is doing well in the United States with a 45% growth rate. The smart move would be to expand to the Middle East first because the region mostly still depends on the oil of which they sit on. Also, it would allow NARENCO to enter the world market slowly and being that China is the biggest solar country, it would not be a good idea to start in China. The solar market in the Middle East is fairly new and solar is not paid a set tariff. Coal in Dubai costs 4.5 cents per kWh which must be imported from Qatar, and is much higher than the price for solar energy (Kraemer, 2016). The major concerns with expanding to the Middle East is how much will be spending on material, employees, and what will the potential profit be. Being that Dubai has already started venturing into solar energy, Ecolab will have to compete with the established companies. To compete with these companies, Ecolab will use the existing technology and knowledge that NARENCO has to offer and hopefully be able to take an advantage against the existing and developing companies in the Middle East. After a successful start-up, Ecolab can keep building more plants or acquire smaller solar energy business within the region.

As we are expanding internationally, we would want Ecolab to continue to run NARENCO in the United States as it was before. The solar energy industry has been rapidly growing, with more than 1 million residential solar installations nationwide and record-breaking growth in the utility sector this past year (F, 2017). The industry is projected to nearly double year-over-year, with a 95% growth rate from 2015 at 7,500 megawatts to 15,000 megawatts of solar PV installed in 2016. This marks for the first time, United States solar ranked as number 1 source of new electric generating capacity additions on an annual

basis. As of 2016, there are more than 1.3 million solar PV installations, with a cumulative capacity of over 40 gigawatts, in the United States (Munsell, 2017). NARENCO has completed 27 projects in the United States, half of them ground mount, powering residential homes in the surrounding areas. One project they have done is install a roof top system for a Food Lion distribution center, with a capacity of 1.1 megawatts, for Duke Energy in North Carolina. NARENCO would expand outside of its regional area that they currently run, and enter bordering states and then throughout the east coast. Being that they have existing relationships with previous contracted companies, it will not be hard to continue established business venture and be able to network to find more companies to contract for.

ECOLAB AND NARENCO

As the global economy shifts away from fossil fuels and other polluting energy, solar has taken the lead ahead of a surge of new alternative industries. Solar itself is comprised of companies of different sizes, offering a large variety of products and services. A short-term decline in the industry was partially caused by the slowing Chinese demand driving solar panel prices down. For example, First Solar Inc. a leader in both production and installation of photovoltaic systems, saw its stock lose more than 50% of its value of the course of 2016. While the stocks are relatively cheap, it is good time to invest in and gain exposure to the industry (Delventhal, 2017). While Ecolab has their foot in the door already with the acquisition of NARENCO, they can invest in smaller businesses and add onto what exists currently.

Ecolab will utilize NARENCO and their technology to incorporate it with Ecolab's current facilities all over the world. Ecolab has 7 manufacturing plants; Singapore, Germany, Brazil, Mexico (3), and Philippines. The use of photovoltaic system can be used to generate power for the general appliances in the facilities, like lighting, air conditioning, and heat. Ecolab can also be using solar power for water heating, which can be used during the process of when manufacturing their products. Switching to solar will save the company money, but it will not have a major impact on reducing cost. After installing solar panels for these facilities, NARENCO will have a foot into the door in these countries. The installations may spark word about the switch to solar and the acquisition of NARENCO throughout the regions. The switch to solar will allow Ecolab to be seen as an environmentally aware company and help push the go green agenda. Ecolab can help advocate the harmful emissions of fossil fuels and the advantages of solar energy. Being that Ecolab is the major

industry leader in providing services, safe hygiene and energy technologies that protect consumers, this business venture will help uphold the reputation Ecolab has and help boost their reputation as well.

FINANCE

Based on the best available information desalination and solar power generation appear to be growth industries with increasing international demand. EcoTeam also believes that the acquisition of Hyflux and NARENCO will be a complementary strategic fit to Ecolab's current operations. This being said, we must keep in mind that an unprofitable acquisition is a losing proposition, regardless of strategic fit. In order to gauge the potential success of these planned purchases, we will analyze a number of financially relevant factors. First, an evaluation of Ecolab's recent and current financial standing must be undertaken. Second, based on our evaluation, a reasonable upper budget and borrowing limit will be established for purchasing Hyflux and NARENCO. Third, an accurate valuation for both companies must be established. a Purchasing NARENCO will be a cash deal well within Ecolab's discretionary budget, but a fair value for Hyflux will prove more challenging due to several factors yet to be discussed. Finally, profit for both businesses must be forecast, and a delineation must be made between processes which could benefit from future investment, and those Ecolab would be best served divesting.

Throughout its history Ecolab has been a financially sound firm with a track record of sustained growth. This trend accelerated in the wake of the 2008 financial crisis as Ecolab engaged in an aggressive international expansion campaign, and undertook a series of profitable acquisitions, the most notable and profitable being Nalco. Ecolab's recent overwhelming success is reflected in key financial measures; at year end 2008 it had a stock price of \$35.15 and gross revenues of \$6.13B, compared to \$103.77 and \$14.28B year end 2014 (Yahoo). In the last three years Ecolab's growth has plateaued. A strong US dollar has comparatively increased prices for Ecolab's overseas products and harmed sales, and

depressed oil prices have taken a toll on Nalco’s once ferociously profitable Nalco Champion oil industry services business (Roberts 2015). For ease of reference, we have included a table detailing Ecolab’s recent financial performance below (Morningstar 2017).

<u>Growth Profitability and Financial Ratios for Ecolab Inc</u>				(Morningstar, 2016)			
Financials							
	2010	2011	2012	2013	2014	2015	2016
Revenue USD Mil	6,089	6,799	11,839	13,253	14,281	13,545	13,152
Operating Income USD Mil	806	753	1,289	1,560	1,955	1,561	1,915
Net Income USD Mil	530	463	704	967	1,202	1,002	1,229
Earnings Per Share USD	2.23	1.91	2.35	3.16	3.93	3.32	4.14
Dividends USD	0.64	0.72	0.83	0.96	1.16	1.34	1.42
Operating Cash Flow USD Mil	950	686	1,203	1,559	1,815	1,999	1,940
Cap Spending USD Mil	-297	-366	-608	-662	-793	-815	-756
Free Cash Flow USD Mil	653	320	596	898	1,022	1,184	1,183
Working Capital USD Mil	545	2,229	1,839	1,210	485	-316	1,260

As seen above, revenues have decreased in 2015 along with both gross and net income, earnings per share, and working capital. Analysis of Ecolab’s 2015 10K shows that the year’s substantial decreases were due to currency pressures and changes in the oil market, as well as new capital allocations. The firm rectified these issues with strategic drawdowns in

oil services, and brought major metrics back in line with previous trends in 2016. From a strategic perspective, the windfalls and subsequent losses in oil services give some credence to the wisdom of diversifying in alternative energy sectors. In the desalination strategy section, an absolute upper budget limit of \$2.5B was established.

A proper valuation of both target firms is essential to ensuring the most cost effective and profitable future performance. An accurate detailed valuation for NARENCO is difficult, as it is a privately held company with limited publicly available information. Even without detailed financial information, reasonable estimates can be made about its growth potential based on projects under development and up for bid. Two large upcoming projects are a 70mw, \$100m farm in Allendale County South Carolina (Downey, 2016), and two plants in Orangeburg County, SC totaling 80mw and \$89.1m (Area Development). If these projects net even a 10% profit, NARENCO's valuation of \$22.5m is highly reasonable. Additionally, NARENCO's asking price could easily be paid in cash with Ecolab's current capital budget.

Valuing Hyflux proved more of a challenge. Despite an influx of contracts for the construction of large desalination and power plants, and a resulting spike in revenue, Hyflux has displayed disappointing performance in all other major metrics in 2016.

<u>Growth Profitability and Financial Ratios for Hyflux Ltd ADR</u>					(Morningstar 2017)		
Financials							
	2010	2011	2012	2013	2014	2015	2016
Revenue SGD Mil	570	482	655	536	321	445	987
Gross Margin %	46.8	46.2	39.3	48.5	49	49.6	26.1
Operating Income SGD Mil	113	83	100	84	99	217	156
Operating Margin %	19.8	17.3	15.3	15.8	30.9	48.8	15.8
Net Income SGD Mil	89	53	61	44	57	52	5
Earnings Per Share SGD	2.04	0.85	0.88	0.48	0.33	0.07	-1.5
Dividends SGD	0.12	0.76	0.14	0.58	0.43	0.45	0.23
Payout Ratio % *	4	31.9	15.8	50	26.7		
Operating Cash Flow SGD Mil	-49	-56	-244	-422	-226	-44	-272
Cap Spending SGD Mil	-41	-58	-46	-13	-14	-29	-36
Free Cash Flow SGD Mil	-90	-115	-290	-436	-240	-72	-308
Working Capital SGD Mil	378	743	523	261	448	50	315

Hyflux's doubling of revenue can be attributed to the construction of the TuasOne waste to energy plant in Singapore, and the massive Qurayyat desalination plant in Oman

(Freyburg, 2016), as well as a new contract for a \$500m desalination plant in Egypt (Water & Wastewater International, 2016). Hyflux attributed losses to the operation of the TuaSpring Desalination and power plant, and incorrect projections for power demand and running costs. Hyflux's net profit for 2016 was \$4.76m, a 91% decrease from 2015, and would have been \$118m were it not for the TuaSpring plant (Khoo,2017). This wild divergence between revenue and net profit proved a major impediment in calculating a growth rate. Based on the last five years of available data, we calculated the annual revenue growth rate to be 1%, and the net profit growth rate to be -20%. As growth rate is a central component of a dividend discount model valuation, this proved to be a thorny problem. Ultimately we decided to conduct a discounted cash flow model, based on a generous estimated growth rate of 3% for the next five years, Hyflux's current weighted average cost of capital of 5.57% (GuruFocus, 2017), and a five-year average gross revenue of \$571m SGD, converted to \$411m USD. Utilizing DCF calculator, we arrived at a figure of \$1.957B, which is just inside our acquisition budget, though pushing the limits of what would be financially acceptable.

REFERENCES

- Bollinger, B. (2016, January 17). Ecolab a Unique Business, One of Bill Gates' Favorite Stocks. Retrieved from <http://www.gurufocus.com/news/384869/ecolab-a-unique-business-one-of-bill-gates-favorite-stocks>
- Ecolab Inc. (n.d.). Retrieved from <http://www.fundinguniverse.com/company-histories/ecolab-inc-history/>
- Gale, T. (2007). Ecolab Inc. Retrieved from <http://www.encyclopedia.com/social-sciences-and-law/economics-business-and-labor/businesses-and-occupations/ecolab-inc>
- Freyberg, T. (2016, May 12). Hyflux first quarter profit up 30% but Tuaspring power could incur losses. Retrieved April 17, 2017, from <http://www.waterworld.com/articles/wwi/2016/05/hyflux-first-quart-profit-up-30-but-tuaspring-power-could-incur-loses.html>
- Khoo, L. (2017, February 23). Hyflux marks 91% slump for FY16 profit. Retrieved April 17, 2017, from <http://www.businesstimes.com.sg/companies-markets/hyflux-marks-91-slump-for-fy16-profit>
- Morningstar. (2017, April 16). Ecolab Inc Key Ratios. Retrieved April 16, 2017, from <http://financials.morningstar.com/ratios/r.html?t=ECL@ion=usa&culture=en-US>
- Roberts, C. (2015, April 28). Ecolab sales down 1 percent, hurt by strong dollar, depressed oil industry. Retrieved April 16, 2017, from <http://www.startribune.com/ecolab-sales-down-1-percent-hurt-by-strong-dollar-depressed-oil-industry/301590041/>

Water & Wastewater International. (2016, March 15). \$500m desalination/power plant helps Hyflux

enter Egypt market. Retrieved April 17, 2017, from

<http://www.waterworld.com/articles/wwi/2016/03/500m-desalination-power-plant-helps-hyflux-enters-egypt-market.html>

Yahoo. (2017, April 16). ECL: Summary for Ecolab Inc. - Yahoo Finance. Retrieved April 16, 2017,

from <https://finance.yahoo.com/quote/ECL?p=ECL>

Chung Lo, C. (2012). A Study of Relationship Marketing on Customer Satisfaction.

Journal of Social Sciences, 8(1), 91-94. doi:10.3844/jssp.2012.91.94 Clark, E. (2015,

September 25). CEO's Letter: The business of doing good - CR Magazine. Retrieved

from <http://www.thecro.com/magazine/vol-6-no-6-septoct-2015/ceos-letter-the-business-of-doing-good/>

Craig, W. (n.d.). Don't market to your customers; educate them instead. Retrieved from

<https://www.forbes.com/sites/williamcraig/2015/04/10/dont-market-to-your-customers-educate-them-instead/3/#3427ce512b52>

Ecolab. (2015). *Solving global challenges sustainably*. Retrieved from

<http://www.ecolab.com/sustainability/sustainability-reports> Ecolab. (n.d.). Our purpose and values. Retrieved from <http://www.ecolab.com/about/our-purpose-and-values>

EPA. (n.d.). Selling Greener Products and Services to the Federal Government | Sustainable

Marketplace: Greener Products and Services | US EPA. Retrieved from

<https://www.epa.gov/greenerproducts/selling-greener-products-and-services-federal-government>

- High, P. (2014, November 24). From acquired to leading the acquirer: Stewart McCutcheon's journey at Ecolab. Retrieved from <https://www.forbes.com/sites/peterhigh/2014/11/24/from-acquired-to-leading-the-acquirer-stewart-mccutcheons-journey-at-ecolab/#6299bc005368>
- Lawler, E. (2015). Executing Innovation for Growth: Q&A with Larry Berger. Retrieved from <http://quarterly.insigniam.com/innovation/leading-technical-innovation-qa-with-larry-berger/>
- Aston University. (2015, February 5). Using solar energy to improve desalination process. *ScienceDaily*. Retrieved April 12, 2017 from www.sciencedaily.com/releases/2015/02/150205111521.htm
- Compain, P. (2012). Solar Energy for Water desalination. *Procedia Engineering*, 46, 220-227. Retrieved April 12, 2017, from http://ac.els-cdn.com/S1877705812045316/1-s2.0-S1877705812045316-main.pdf?_tid=c7f77b70-1fce-11e7-8ae2-00000aacb361&acdnat=1492036044_8412131514cf6d6dd2a8968355bcfaf8
- National Renewable Energy Corporation. (2017, April 11). Retrieved April 12, 2017, from https://en.wikipedia.org/wiki/National_Renewable_Energy_Corporation
- Unique Solar and Solar/Hybrid and Dist Product line with 45% GROWTH. | Businesses for Sale Charlotte North Carolina. (n.d.). Retrieved April 12, 2017, from <https://www.bizquest.com/business-for-sale/unique-solar-and-solar-hybrid-and-dist-product-line-with-45-growth/1216131/?q=a3dpZD03NSZvPTE>
- Solar Energy. (n.d.). Retrieved April 12, 2017, from <http://www.seia.org/about/solar-energy>
- Weber, D. (2016, June 21). 10 Reasons to go Solar. Retrieved April 12, 2017, from

<https://1stlightenergy.com/10-reasons-to-go-solar/>

China's solar power capacity more than doubles in 2016. (2017, February 04). Retrieved April

15, 2017, from <http://www.reuters.com/article/us-china-solar-idUSKBN15J0G7>

Mauthner, F., Weiss, W., & Spork-Dur, M. (2016). Markets and Contribution to the Energy

Supply 2014. *Solar Heat Worldwide*, 1-74. Retrieved from

<http://www.ieashc.org/data/sites/1/publications/Solar-Heat-Worldwide-2016.pdf>

Munsell, M. (2017, February 15). US Solar Market Grows 95% in 2016, Smashes Records.

Retrieved April 16, 2017, from <https://www.greentechmedia.com/articles/read/us-solar-market-grows-95-in-2016-smashes-records>

European Photovoltaic Industry Association (2017) Retrieved April 15, 2017, from

<https://web.archive.org/web/20121203185136/http://www.epia.org:80/news/publications/>

"Annual Solar Photovoltaics Production by Country, 1995-2012". Earth Policy Institute.

2013-07-31. Retrieved 2014-08-08.

Whittaker, G. C. (2016, June 10). Is the Middle East the World's Next Solar Energy Giant?

Retrieved April 15, 2017, from <http://www.thedailybeast.com/articles/2016/06/10/is-the-middle-east-the-world-s-next-solar-energy-giant.html>

Kraemer, S. (2016, July 6). What Is Driving the Middle East Solar Market? Retrieved April 15,

2017, from <http://www.renewableenergyworld.com/articles/print/volume-19/issue-8/features/solar/what-is-driving-the-middle-east-solar-market.html>

F. (2017, February 10). The Solar Energy Industry is Changing Due to Innovation. Retrieved

April 15, 2017, from <http://www.prnewswire.com/news-releases/the-solar-energy-industry-is-changing-due-to-innovation-613401203.html>

E. (n.d.). Why Solar Energy? Retrieved April 15, 2017, from

<http://www.engineering.com/SustainableEngineering/RenewableEnergyEngineering/SolarEnergyEngineering/WhySolarEnergy/tabid/3893/Default.aspx>

Delventhal, S. (2017, January 13). The Current State of the Solar Energy Industry. Retrieved April 16, 2017, from <http://www.investopedia.com/news/current-state-solar-energy-industry/>

Ecolab. (n.d.). About Ecolab | We Circle the Globe. Retrieved April 16, 2017, from <http://www.ecolab.com/about>

Hayakawa, A. (n.d.). Olivia Lum: From orphan to entrepreneur. Retrieved April 16, 2017, from <http://asia.nikkei.com/magazine/20160324-WHAT-DOES-IT-MEAN-FOR-ASIA/Special-Report/Olivia-Lum-From-orphan-to-entrepreneur/Olivia-Lum-From-orphan-to-entrepreneur>

Leaders Online. (n.d.). The Boldness to Dream. Retrieved April 16, 2017, from http://www.leadersmag.com/issues/2012.1_Jan/ROB/LEADERS-Olivia-Lum-Hyflux-Lt.html

National Environmental Agency. (2015, September 15). Hyflux Ltd and Consortium Partner Mitsubishi Heavy Industries Ltd to Build New Waste-To-Energy Plant in Tuas. Retrieved April 16, 2017, from <http://www.nea.gov.sg/corporate-functions/newsroom/news-releases/hyflux-ltd-and-consortium-partner-mitsubishi-heavy-industries-ltd-to-build-new-waste-to-energy-plant-in-tuas>

Leven, R. (2013, August 21). U.S. Desalination Industry Grows Since 2000; Seen as Essential to Meeting Supply Needs. Retrieved April 15, 2017, from <https://www.bna.com/us-desalination-industry-n17179876105/>

Terblanche, V., & Mckinley, D. (2014, December 11). Rise in Middle East IWPs as Demand for

- Water Increases. Retrieved April 15, 2017, from <http://www.al-mirsal.com/2014/12/11/rise-in-middle-east-iwps-as-demand-for-water-increase/>
- Money Zine. (2015, January 30). Debt and Leverage Ratios Calculator. Retrieved April 09, 2017, from <http://www.money-zine.com/calculators/investment-calculators/debt-and-leverage-ratios-calculator/>
- Princiotta, J. (2016, October 14). Moody's assigns Baa1 to Ecolab's new \$1 billion senior unsecured notes issue. Retrieved April 09, 2017, from https://www.moody's.com/research/Moodys-assigns-Baa1-to-Ecolabs-new-1-billion-senior-unsecured--PR_356337
- Krishna, H. J. (n.d.). Introduction to Desalination Technologies (Texas, Texas Water Development Board). Austin, TX: Texas Water Development Board.
- Nalco Water Home. (n.d.). Retrieved April 08, 2017, from <http://www.ecolab.com/nalco-water>
- Nanalyze. (2015, September 24). Investing in Desalination Companies. Retrieved April 09, 2017, from <http://www.nanalyze.com/2014/09/investing-in-desalination-companies/>
- Schlosser, C. A. (1970, January 01). The Future of Global Water Stress: An Integrated Assessment. Retrieved April 08, 2017, from <https://globalchange.mit.edu/publication/16014>
- Zabarenko, D. (2011, October 25). Water use rising faster than world population. Retrieved April 08, 2017, from <http://www.reuters.com/article/us-population-water-idUSTRE79O3WO20111025>

Hyflux. (n.d.). Hyflux » Awards & Accolades. Retrieved April 16, 2017, from

<https://www.hyflux.com/about-us/awards-accolades/>

Area Development. (2017, January 06). NARENCO Plans Two Solar Farms In Orangeburg

County, South Carolina. Retrieved April 17, 2017, from

<http://www.areadevelopment.com/newsItems/1-6-2017/narenco-solar-farms-orangeburg-county-south-carolina.shtml>

Morningstar. (2017, April 16). Ecolab Inc. Key Ratios. Retrieved April 16, 2017, from

<http://financials.morningstar.com/ratios/r.html?t=ECL@ion=usa&culture=en-US>

Roberts, C. (2015, April 28). Ecolab sales down 1 percent, hurt by strong dollar, depressed oil

industry. Retrieved April 16, 2017, from [http://www.startribune.com/ecolab-sales-down-](http://www.startribune.com/ecolab-sales-down-1-percent-hurt-by-strong-dollar-depressed-oil-industry/301590041/)

[1-percent-hurt-by-strong-dollar-depressed-oil-industry/301590041/](http://www.startribune.com/ecolab-sales-down-1-percent-hurt-by-strong-dollar-depressed-oil-industry/301590041/)

Yahoo. (2017, April 16). ECL: Summary for Ecolab Inc. - Yahoo Finance. Retrieved April 16,

2017, from <https://finance.yahoo.com/quote/ECL?p=ECL>