Business Strategy for Power Distribution Equipment Manufacturer in a Deregulated Electric Power Industry

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B.S. Industrial Engineering & Management
Technion - Israel Institute of Technology, 1997

Submitted to the Sloan School of Management and the Engineering Systems Division in Partial Fulfillment of the Requirements for the Degrees of
Masters of Business Administration
And
Master of Science in Civil and Environmental Engineering

In conjunction with the Leaders for Manufacturing program at the Massachusetts Institute of Technology

May 2002

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Abstract

Deregulation of the electric power industry has triggered a chain of events that resulted in new competitive pressures within the industry. Pressures applied to utilities will resonate throughout the supply chain and inevitably affect their suppliers, among them are the distribution transformer OEMs. Over the years, ubiquitous product design capabilities and increasing price sensitivity have lead to the commoditization of the distribution transformers. The strategic goal for transformer OEMs should be to break away from the price-sensitive, transactional relationships currently governing their relationships with their customers and reorient their relationships towards more cooperative, long-term ones.

OEMs are tasked with formulating a response to changes in the electric power industry. In doing so they must consider both the needs of their customers and the specific constraints that govern their industry. Relative to other industries, electricity distribution infrastructure is one that is characterized by long lead-times and rigorous planning. Currently no transformer OEM seems to be making any noticeable efforts to profit from these characteristics. Instead they are investing in strategies designed to enhance their responsiveness.

Responsive manufacturing systems are expensive to setup and operate. Excess capacity required to deal with demand surges is often very taxing on companies' cost structures. Investment in planning processes in place of flexible manufacturing systems seems like a far more cost effective and reasonable approach to dealing with the industry's demand patterns. Effective communication between customers and OEMs has the potential to significantly reduce supply chain costs by allowing trading partners more flexibility to actively manage various cost tradeoffs.

Bundling transformers with value-adding logistics and engineering services can potentially help OEMs to differentiate their product in the market and capture higher margin service revenues. Bundling combined with a collaborative customer relationship will allow OEMs to break away from short-term, price-driven business relationships and establish more long-term collaborative ones. Such relationships will help trading partners realize benefits from collaborative decision-making and help OEMs promote customer lock-in.
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1. Introduction

"Every firm competing in an industry has a competitive strategy, whether explicit or implicit...there are significant benefits to be gained through an explicit process of formulating strategy, to ensure that at least the policies (if not the actions) of functional departments [within the firm] are coordinated and directed at some common set of goals...The goal of a competitive strategy for a business unit in an industry is to find a position where the company can best defend itself against...competitive forces or can influence them in its favor." Michael E. Porter, Competitive Strategy

This paper will attempt to formulate a competitive business strategy for a distribution transformer manufacturer operating in the United States. Michael E. Porter's framework for structural analysis of industries will be used as a general guide for analyzing the distribution transformer industry. The purpose of this analysis will be to deduce in a structured and convincing manner a business strategy for a distribution transformer manufacturer.

Specific attention will be given to the electric utility industry and the transformation it is undergoing. The market for distribution transformers is highly dependant on the electric utilities industry, specifically its electricity distribution segment. A thorough understanding of its internal dynamics is therefore key to understanding the distribution transformer market and will provide the basis for any discussion of that industry.

Throughout the thesis the name Distribution Transformer Manufacturer (DTM) will be used in place of the actual name of the manufacturer.

2. Electrical Utility Industry

The survey of deregulation activities undergoing the electric utility industry provided in this chapter is based on relevant publications by the Energy Information Administration (EIA).

2.1. General Industry Structure

The fundamental structure of the electric utility industry has been based on vertically-integrated utilities serving three main functions; generation, transmission, and distribution of electricity. Generation is generally referred to as the process by which fuels (gas, coal, nuclear
fuel, etc.) or renewable sources of energy (hydraulic energy or solar energy) are converted into electric energy. Transmission is the process by which the generated electricity is moved in "bulk" from the generation plant to the wholesale purchaser. Distribution is the process of delivering the power from the wholesale purchaser to the retail consumer.

Generation:

Generation facilities have been historically owned and operated by electric utilities and non-utility generators. The ownership and maintenance of generating units is intended to satisfy utility requirement to meet three major types of load; base, intermediate, and peak. Base-load generating units are normally used to satisfy all or part of the minimum or base load of the system and therefore run continuously and produce electricity at a constant rate. These units are generally the largest of the three types of units, but they cannot be brought on-line or taken off-line quickly. Peak-load generating units can be brought on line quickly and are used to meet requirements during the periods of peak load on the system. They typically come in the form of smaller plants using gas and combustion turbines. Intermediate-load generating units meet system requirements that are greater than base-load but less than peak-load. Intermediate-load units are used during the transition between base-load and peak-load requirements.

Transmission:

Electric power transmission is the transportation of large blocks of power over relatively long distances from a central generating station to main substations close to major load centers or from one central station to another for load sharing. The transmission grid consists of high voltage (between 138 and 765 kilovolts) overhead and underground conducting lines made of either copper or aluminum. High-voltage transmission lines are used because they require less surface area for a given carrying power capacity, and result in less line loss.

Because of resistance in the conductors, some power is "lost" as dissipated heat during transmission. At the generating station, the voltage of the three-phase alternating current output from the generator is increased to the required transmission voltage by a step-up transformer. The high-voltage alternating current is then transmitted through the transmission grid to the load center where it is again transformed (stepped down) to lower voltages required by distribution lines.

In the United States, investor-owned utilities (IOUs) own roughly 70 percent of the transmission lines, Federally owned utilities own 15 percent, and public utilities and cooperative
utilities own another 15 percent. Not all utilities own transmission lines and no independent power producers or power marketers own transmission lines. Virtually all U.S. utilities are interconnected with at least one other utility through interconnected transmission networks. The interconnected utilities coordinate operations and buy and sell power among themselves.¹

Distribution:

Electricity distribution is the delivery of electric power from the transmission system to the end-use consumer. The distribution systems begin at the substations, where power transmitted on high voltage transmission lines is transformed (stepped down) to lower voltages for delivery over low voltage lines to the consumer sites. The system ends at the consumers’ meters. Distribution is considered a “natural monopoly” because duplicate systems of lines would be impractical and costly to set up and maintain.

Generally speaking, the final electricity price is comprised of 55% supply and generation costs, 25% distribution, 10% transmission, and 10% administration/metering/profit.²

2.2. Electric Utilities

Electric utilities in general are defined as either privately owned companies or public agencies engaged in the generation, transmission, and/or distribution of electric power for public use. Utilities can be further classified into four subcategories based on ownership; investor-owned, federally-owned, other publicly-owned, and cooperatively owned. See Appendix A for a more detailed characterization of the different types of electric utility ownership. Not all utilities companies perform all three of the functions needed to provide electricity, namely generation, transmission, and distribution. Less than a third of all utilities actually participate in the generation of electricity. Roughly two thirds of electric utilities are exclusively distribution utilities, purchasing wholesale power from others to distribute it over their own distribution lines to the ultimate consumer. These are primarily the utilities owned by state, local governments and cooperatives. All non-utilities operating in the electricity market generate power but do not own or operate any of the transmission and distribution systems.³

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Under the traditional system, utilities are given a monopoly franchise over a specific geographic area. In return for this franchise, the electric utility is regulated by state and federal agencies. Some electric utilities have service territories extending beyond a single county. Others just serve a municipality or part of a county. To move electricity among utilities, an extensive system of high-voltage transmission lines is owned and operated by the larger utilities. This transmission network permits electricity trading between utilities. Without transmission facilities, electricity could not be moved from power plants to the thousands of distribution systems serving the millions of electricity consumers.

There are roughly 3,200 utilities throughout the United States, with approximately 700 of them operating facilities that generate electric power. Many electric utilities are exclusively distribution utilities. These utilities purchase wholesale power and distribute it over their distribution network to the end user.

2.2.1. IOU

Two basic organizational forms exist among investor-owned utilities (IOUs). The most prevalent is the individual corporation. Another common form is the holding company, in which a parent company is established to own one or more operating utility companies. Most of the IOUs sell power at retail rates to several different classes of consumers and at wholesale rates to other utilities, including other investor-owned, federal, state and local government utilities, public utility districts, and rural electric cooperatives. Virtually all investor-owned electric utilities own and operate generating capacity.

2.2.2. Federal Utilities

There are nine federal electric utilities in the United States. They include four operating entities: the Department of Defense's U.S. Army Corps of Engineers (USACE), the Department of the Interior's U.S. Bureau of Reclamation, the Department of the Interior's U.S. Bureau of Indian Affairs (USBR), and the Department of State's International Water and Boundary Commission. These entities operate the federal hydro-electric plants. Also included in this category are four federal power marketing administrations (PMAs): the Bonneville Power Administration, the Western Area Power Administration, the Southwestern Power

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Federal utilities exist to market and sell the power produced at federal hydroelectric projects. They also purchase energy for resale from other electric utilities in the United States and Canada. The ninth federal utility is the Tennessee Valley Authority (TVA), the largest federal power producer, which operates its own power plants and sells the power in the Tennessee Valley region in both the wholesale and retail markets. The TVA generates electricity from coal, gas, oil, and nuclear power as well as hydropower.\textsuperscript{5}

Federal utilities generally supply power to large industrial consumers or federal installations. Most of the remaining energy generated by these utilities is sold in the wholesale market to publicly owned utilities and rural cooperatives at cost. These wholesale consumers have preference claims to federal electricity. Only the surplus remaining after meeting the energy requirements of preference consumers is sold to investor-owned utilities.

2.2.3. Publicly-owned utilities

Publicly owned electric utilities can be categorized as generators and non-generators. Generators are those electric utilities that own and operate generating capacity to supply some or all of their customers' needs. Some generators supplement their production by purchasing power. The non-generators rely exclusively on power purchases. Their primary function is to distribute electricity to their consumers. The non-generators comprise over half of the total number of publicly owned electric utilities. Other publicly owned utilities include municipal authorities, state authorities, public power districts, irrigation districts, and other state organizations. Municipal utilities tend to be concentrated in cities where the loads are small. In general, publicly-owned utilities tend to have lower costs than investor-owned utilities because they often have access to tax-free financing and do not pay certain taxes or dividends. They also tend to have high-density service areas.

2.2.4. Rural electric cooperatives

Rural electric utilities are sometimes referred to as Community-Owned Utilities (COU). Most rural electric cooperative utilities are formed and owned by groups of residents in rural areas to supply power to those areas. Some cooperatives may be owned by a number of other

cooperatives. There are three types of cooperatives: distribution only, distribution with power supply, and generation and transmission. Cooperatives currently represent about a third of the total number of utilities in the country.

2.2.5. Non federal power marketers

The introduction of the competitive wholesale market for electricity has brought about a fifth subcategory of electric utilities and power marketers. They are classified as electric utilities because they buy and sell electricity at the wholesale and retail levels. They do not own or operate generation, transmission, or distribution facilities.

2.2.6. Non-utilities

Non-utilities are privately owned entities that generate power for their own use and/or for sale to utilities and others. They are also referred to sometimes as Qualifying Facilities (QF).

2.2.7. Retail Sales by Sector

Electricity is sold to four sectors of retail consumers; residential, commercial, industrial, and “other.” The residential sector includes private households and apartment buildings where energy is consumed primarily for space heating, water heating, air conditioning, lighting, and operation of electrical appliances. The commercial sector includes non-manufacturing business establishments such as hotels, motels, restaurants, wholesale businesses, retail stores, and health, social, and educational institutions. The industrial sector includes manufacturing, construction, mining, agriculture, fishing, and forestry establishments. The “other” sector includes public street and highway lighting, railroads and railways, municipalities, divisions or agencies of state and federal governments under special contracts or agreements, and other utility departments.

2.2.8. Distribution Utilities

Electric distribution utilities are the companies, or functions within vertically integrated electric utilities that own and manage the physical infrastructure going from the transmission grid to the customer point of use. In layman’s terms, they are the companies that own the wires going to homes and commercials sites.

The distribution systems begin at the substations, where power transmitted on high-voltage transmission lines is transformed to lower voltages for delivery over low-voltage lines to the consumer sites. The system ends at the consumers’ meters. Distribution is considered a
“natural monopoly”\(^6\) and is likely to remain a regulated function because duplicate systems of lines would be impractical and costly.

The distribution of electric power is an intrastate function under the jurisdiction of state Public Utility Commissions (PUCs). Under the traditional regulatory system, the Public Utilities Commissions of each state set the retail rates for electricity, based on the cost of providing the service. Retail rates are set by the PUC in ratemaking rulings. The rates include the cost to the utility for generated and purchased power, the capital costs of power plants, transmission, and distribution grids, all operations and maintenance expenses, and the costs to provide programs often mandated by the PUC for consumer protections and energy efficiency, as well as taxes.

As the industry restructures, in some states the PUC will eventually no longer regulate the retail rates for generated or purchased power. Retail electricity prices will be open to the market forces of competition. The PUCs will continue to regulate the rates for distribution of power to the consumer. They also have a say in the siting of distribution lines, substations, and generators. Metering and billing are also under jurisdiction of the PUC. In some states these functions are being opened to competition also.

2.2.9. History of Regulation

The foundation for regulatory involvement in the electricity industry was established in the early 1900s. The electric power industry was recognized as a natural monopoly. With monopolies outlawed in the U.S. by the Sherman Antitrust Act, regulation became a necessity. Interstate wholesale markets and transmission became regulated by the Federal Power Commission. In 1997, that authority was given to the Federal Energy Regulatory Commission (FERC). Intrastate electricity markets (mostly retail) were regulated by the state Public Utilities Commission (PUC).

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\(^6\) "A given production technology is said to exhibit the property of a natural monopoly is a single firm can supply the market at lower cost than two or more firms" Sidak, Gregory J. and Spulber, Daniel F. "Deregulatory Takings and the Regulatory Contract: The Competitive Transformation of Network Industries in the United States." Cambridge University Press. 1997
power. Retail electricity prices will be open to the market forces of competition. The PUCs will continue to regulate the rates for distribution of power to the consumer. They also have a say in the siting of distribution lines, substations, and generators. Metering and billing are under jurisdiction of the PUC and in some States are becoming competitive functions.

The FERC has jurisdiction over interstate movement of electricity by investor-owned utilities, power marketers, power pools, power exchanges, and independent system operators (ISOs). FERC approves rates for wholesale trade of electricity and reviews rates set by the Federal Power Marketing Administrations (PMAs). FERC also confers Exempt Wholesale Generator status (a classification of generator created by the Energy Policy Act of 1992 (EPACT)) and certifies qualifying small power producers and cogeneration facilities under provisions of PURPA. An additional responsibility of FERC is licensing the construction and operation of hydroelectric power projects and enforcing the provisions of the licenses.7

The State Public Utility Commissions (PUCs) have jurisdiction over intrastate trade of electricity. The PUCs regulate retail rates for customers, approve sites for generation facilities, and issue state environmental regulations.

A third regulating agency is the Environmental Protection Agency (EPA). It is charged with implementing the provisions of Title IV of the Clean Air Act. The EPA establishes rules requiring fossil-fueled power plants to reduce the air emissions and pollutants.

Other regulatory and planning agencies are the North American Electric Reliability Council (NERC) and the Control Area Operators (CAO). The NERCs are established in response to a major blackout in the Northeastern United States in 1965. As a result of that blackout, the NERC was established and assigned responsibility for overall reliability, planning, and coordination of the electricity supply in North America. Control Area Operators (CAO) are responsible for the efficient and reliable operation of interconnected electric power systems. Because electric energy is instantaneously generated and consumed, the operation of an electric power system requires a coordinated balancing of generation and consumption of power. The CAOs essentially balance supply and demand on the transmission grid. Most CAOs are run by the dominant large investor-owned utilities that are a part of the interconnected transmission grid and power plant system.


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2.2.10. Deregulation

The electric power industry in the U.S. is in transition from a regulated monopoly to a deregulated industry. In recent years, the industry has experienced a substantial increase in competition at the wholesale level. These changes were brought about by changes in federal law and regulatory policy. Several states have also decided to restructure aspects of retail electric service. The issue of retail restructuring and competition is being reviewed by a number of states and bills have been introduced in Congress that seek to promote such restructuring in all states.

For years the electric power industry was managed and operated based on the premise that electric power production and delivery were natural monopolies. Large centralized power suppliers were considered the most efficient and inexpensive means for producing electric power and delivering it to customers. As a result, large vertically-integrated power producers emerged. They performed all functions associated with the delivery of power, namely generation, transmission and distribution, in an integrated fashion. These electric utilities operated in designated and exclusive franchise areas. Along with the right to exclusive operation rights in a given area came the obligation to serve all consumers within that area. As a result, economies of scale were achieved. Because of the monopoly structure, federal and state government regulations were developed to control operating procedures, prices, and entry to the industry in order to protect consumers from potential monopolistic abuses. In addition to protecting consumers, regulation assured the reliability of electric power supply and a fair rate of return for the utility. The result of these multiple goals was traditional rate-based regulation.

Several factors have caused legislators to restructure the electric power industry from a regulated monopoly to a competitive market. First, technological advances have changed the economics of power generation. New gas-fired combined cycle power plants have become more efficient and less costly than older coal-fired power plants. In other words, smaller scale generation equipment could achieve per unit costs that are comparable to those of large scale facilities. Second, technological advances in electricity transmission equipment have made possible the economical transport of power over long distances without significant losses, making it possible for distant power generators to compete for customers beyond their traditional, regulated operating region. A major catalyst in this process was the significant real increase in residential and industrial electricity prices that occurred in the decade between 1975 and 1985. Electricity prices rose 13 percent for residential consumers and 28 percent for
industrial consumers over those 10 years.\(^8\) As a result, economists and public policy analysts began debating the advantages of competition over regulation and promoted the idea that free markets can drive down costs and prices by reducing inefficiencies. In addition, they argued that competitive industries are more likely to innovate with new technologies. As a result, deregulation and competition became a viable alternative to traditional regulation.

In recent years, legislators and regulators adopted the arguments made by economists and public policy analysts and have begun making laws and rules that promote competition in the electric power industry. They believed that consumers will benefit more from an industry that is governed by competition than from an industry that is governed by regulators.

Consumers that have traditionally welcomed the protection of regulation and felt that its presence assured them fair prices. Nevertheless, as a result of years of increasing rates, they also began pushing for competition. The main consumer advocates for change were large industrial users of electricity who, in some areas of the United States, have been burdened by high electricity prices while their competitors in other areas paid far less for their electricity, thus creating an "unfair" competitive business environment.

Legislation regarding deregulation has occurred on two levels. First, opening access to the transmission network and allowing all generators fair access to the grid. Second, unbundling the generation, transmission and distribution functions into independent entities. The purpose of this legislation was to create a business environment that was conducive to competition.

While deregulation gained noticeable momentum in the past few years, change began long before. The Public Utility Regulatory Policies Act of 1978 (PURPA) stipulated that electric utilities had to interconnect with one another and buy, at the utilities avoided cost, capacity and energy offered by any nonutility facility meeting certain criteria established by Federal Energy Regulatory Commission's (FERC).\(^9\) While the goal of this legislation was to promote the efficient use of fossil fuels through smaller, independent power producers, it also provided a foundation for competition to develop.

Competition in wholesale power market received a boost from the Energy Policy Act of 1992 (EPACT), which expanded the FERC authority to order vertically-integrated investor

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owned utilities (IOUs) to allow nonutility power producers access to the transmission grid to sell power in an open market. FERC’s authority to order access was implemented on a case-by-case basis and proved to be slow and cumbersome. To remedy that, FERC issued Order 888 requiring all vertically-integrated IOUs to file an open access transmission tariff that would provide universal access to the transmission grid to all qualified users. Order 888 was an important stimulus in the development and strengthening of competitive wholesale power markets, but discriminatory practices regarding access to the transmission grid still remained. As a result, in December 1999, FERC issued Order 2000 calling for the creation of regional transmission organizations (RTOs), independent entities that will control and operate the transmission grid free of any discriminatory practices.

In addition to wholesale competition, retail competition has been introduced in several states. Retail customers have been given a choice of electricity suppliers. While the delivery of electricity to the retail customer remained at the hands of the local utility and its distribution network, retail customers were allowed to source the electricity from other utilities. As a result, the retail customer would pay a distribution fee to the local distribution utility and an energy fee to the generating utility that actually generated the electricity consumed.

Under the various proposals for restructuring, only the generation segment of the industry would be deregulated. Once deregulation activities complete their course, generation utilities will no longer have ownership or control of transmission and/or distribution facilities. Generation companies will only provide the actual electricity. Power plants would have fewer limitations on where and at what prices they might sell their electricity. Transmission and distribution utilities would still be regulated, and these companies would likely still have exclusive service territories.

3. Distribution Transformer Industry

3.1. Distribution Transformer Manufacturer

Distribution Transformer Manufacturer (DTM) is a manufacturer of distribution transformers. It designs, manufactures, markets and sells distribution transformers.
Distribution transformers reduce high voltages transmitted on electrical distribution lines to usable levels (120 and 240 volts) for homes, offices and factories. They may be mounted on a utility pole, placed at ground level on a pad or in underground vaults. Electric power transformers are designed for utility and industrial customers to be installed in substations or commercial electric power centers for apartment complexes, shopping centers, factories and other consumers of electrical power.

DTM serves three major markets for distribution transformers: industrial, construction, and electrical power distribution. The company experiences substantial competition in all of its business segments. Competition comes from both larger and smaller companies with the key competitive factors being price, performance, quality, brand name and availability. Price and availability far outweigh other factors in importance. Because of the size and weight of the product, and the economics of transporting it, most of the competition comes from within the NAFTA region. DTM realizes its main source of competitive advantage from short order fulfillment time (availability) and general product quality.

DTM sales and marketing are executed through two main channels; DTM sales force, and independent distributors. The vast majority of sales are executed through DTM’s internal sales force. This sales force acts on the behalf of the entire company in which DTM is a division and sells a broad line of products in addition to distribution transformers. Transformer products are
sold primarily to electric utility companies and contractors throughout the United States. In addition, direct sales to commercial and industrial users of electric power are increasing as the restructuring in the electrical utility industry allows industrial users more flexibility in sourcing electrical power.

DTM is a significant player in the distribution transformer market, with market share ranging from 20% to 40%, depending on the product line. DTM sells roughly 20% of its product through distributors.

Research and development activities in the company are for purposes of improving existing products and production processes, with a special effort on increasing production efficiencies and reducing product cost. While the technical specifications of the product are predetermined by the customer, some degree of flexibility remains for the manufacturer. Within the confines of this limited design flexibility, DTM is continuously attempting to reducing product cost through better manufacturing processes and better material usage.

The principal raw materials required for manufacturing distribution transformers are aluminum, copper, steel, various insulating materials and polymers. These raw materials are available from and supplied by multiple sources located in the United States and abroad.

DTM engineers and produces products designed to meet the specific needs and applications of its customers. Teams representing different functional areas within the division work closely with customers early in their product-design process to ensure that the product meets the customer's specifications and is cost effective to manufacture. Engineering costs associated with specific customer orders are capitalized as part of product cost.

Demand and profitability for the distribution transformer market are generally affected by the level of domestic economic activity in the consumer, commercial and industrial markets served. Housing starts, commercial and industrial construction, maintenance and upgrading of established electrical distribution systems, and electrical usage are key indicators of demand for distribution transformers.

3.2. Customers

Distribution transformer manufacturers have three general buying groups; distribution utilities, contractors, and wholesale electrical distributors. Customers in the industry may be broadly segmented into two segments; transactional and relationship. Transactional customers consider each purchase individually. They seek out the best value at any given point in time. As
a result, customers need to be reacquired through a competitive bidding process for every purchase they make. Relationship customers establish long-term contracts/relationships with manufacturers and execute to those commitments through repeat orders. In return for their commitment to a single manufacturer, they typically require higher responsiveness and availability and discounted pricing.

3.2.1. Distribution utilities

Distribution utilities are regulated firms that own and operate the distribution network of wires and equipment necessary to deliver electricity from the transmission network to the retail consumer. Historically these companies have sometimes been part of a larger, vertically integrated electric utility that would encompass the generation, transmission and distribution functions all under one roof. Pure distribution utilities are also present in the market. Due to recent changes in the regulatory and legislative environment, distribution functions of integrated utilities are being increasingly separated from the generation and transmission either functionally or through divestitures.

There are various types of distribution utilities. Though they all perform the same basic function of delivering electricity from the transmission network to the retail consumer, they are subject to different regulatory rules. See description of the various types of utilities in Appendix A.

3.2.2. Contractors

Contractors are engaged in construction projects that require the installation of electrical distribution equipment such as wires and distribution transformers. When called upon to install such equipment, the contractor places an order with an electrical wholesale distributor or directly with the manufacturer for product with approved specifications by the local utility.

3.2.3. Electrical Wholesale Distributors

Electrical Wholesale distributors provide a broad product offering and a range of related services to a wide variety of industrial companies, contractors for industrial, commercial and residential projects, and utility companies. They are effectively acting as middlemen between customers and manufacturers. They own distribution networks that stock and deliver product to the customer. In recent years they have broadened their relationships with their customers
through various types of third party outsourcing relationships, where the distributor manages inventories for its customer in return for a fee and/or a commitment to exclusivity.

3.3. Suppliers

Material costs comprise roughly 65% of the cost of manufacturing a transformer. The principal raw materials required for manufacturing distribution transformers are aluminum, copper, steel, various insulating materials and polymers. In addition, manufacturers install various components into product that typically require subassembly work. Subassemblies may either be done in-house or purchased from suppliers in assembled form.

3.4. General Industry Drivers

The distribution transformer business segment is comprised of three main markets:

- Replacement market for old and failed units. This market is driven by the need for replacement of existing transformers by the electric distribution utilities in response to various types of failures issues ranging from preventative maintenance to natural disaster.

- Residential construction. This market is driven by new housing starts. The construction of new houses requires the extension of the electrical distribution networks and with it the installation of electricity distribution equipment.

- Non-residential construction (commercial construction). This market is driven by industrial construction. The construction of new commercial sites requires the extension of the electrical distribution network, and with it the installation of new distribution transformers.

Demand and profitability for the distribution transformer market are generally affected by the level of domestic economic activity in the consumer, commercial and industrial markets served. Housing starts, commercial and industrial construction, maintenance and upgrading of established electrical systems, and electricity usage are key indicators of demand for the market's various electrical products.

It is generally accepted that the leading indicators for the business segment are Gross Domestic Product (GDP)

\footnote{Gross domestic product (GDP). GDP is a broad measure of aggregate economic activity. It is the market value of goods and services produced by labor and capital in the United States. Growth in the economy is measured by changes in inflation-adjusted (or real) GDP. GDP is reported quarterly by the U.S. Department of Commerce.}^{10}, Industrial Production Index\footnote{Industrial Production Index}, housing starts and the nonresidential
construction index. These indicators provide a good estimation for the expected volume of sales for new distribution transformers and therefore establish the basis for any long and medium-term planning for transformer manufacturers. GDP is a good indicator of underlying growth in national demand for electricity. Electricity usage closely mirrors the rate of economic growth. For an individual utility company, demand growth depends heavily on economic trends within its geographic region. Those may vary significantly among the different regions within the United States.

The distribution transformer market is comprised of 4 distinct product families:

- Specialty products, typically large 3 phase pad mounted transformers.
- Three-phase pad mounted transformers.
- Single-phase pad mounted transformers.
- Overhead single-phase transformers (pole type).

Demand for padmount units is generally driven by the construction market. The overhead transformer market is a mature one. Many older transformers are in circulation and need replacement. Replacement units are the main sales driver in this segment. The replacement market for the overhead transformers accounts for roughly 30-40% of overhead transformer sales, whereas padmount replacement market only accounts for roughly 10% of padmount sales. The padmount replacement market is expected to grow in the future as these transformers mature.

The overall estimated market size for distribution transformers is estimated at around 1.3-1.4B USD per year.

Deregulation has changed the general operating attitude and goals of the electric utilities. From business entities with regulated returns on investment, they have become more short-term focused. Anecdotal evidence gathered from interviews with DTM marketing people suggests that customer preference has shifted from low cost of ownership, product quality and life cycle reliability to order fulfillment speed and upfront price (as opposed to ownership cost).

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11 Industrial production Index. Industrial Production Index indicates trends in electricity demand from the industrial production market segment. Regional results can vary with the type of industry served, depending on the industry's propensity for electricity consumption, its implementation of energy conservation and efficiency programs, and other variables. The industrial production index reported monthly by the U.S. Federal Reserve Board.
3.5. Barriers to Entry

3.5.1. Economies of scale

The economics of manufacturing distribution transformers requires relatively high fixed cost investments. Volume production is critical in amortizing fixed costs and achieving competitive production costs. Nevertheless, since the manufacturing technologies that go into the manufacturing of distribution transformers are fairly generic in nature, manufacturing can be outsourced with relative ease to contract manufacturers. As a result, scale economies do not necessarily drive investment decision in the distribution transformer space.

With the industry clearly in its mature phase, product design and production technologies are expected to only marginally improve. With no breakthrough technologies in the foreseeable future threatening to undermine the economic viability of prevailing technologies, existing investments are expected to carry well into the future, thus reinforcing scale economies as an asset.

3.5.2. Product differentiation

Though distribution transformers are manufactured to unique customer specifications, there is no binding customer loyalty that is hard for competition to overcome. Manufacturing the product to customer specifications does not require any proprietary knowledge. Furthermore, customers typically seek out several manufacturers to produce their product in order to promote price and service competition. Producing custom products that comply with customer specifications has therefore become the industry standard and offers no lasting customer loyalty.

Suppliers' inability to differentiate their product has turned the distribution transformer into a commodity-like product. Little differentiation occurs based on product design, because product is manufactured to customer specification. Though there are slight variations in design of product among the different suppliers, the basic functionality and design ultimately complies with customer determined specification.

The industry consensus that the distribution transformer is a mature product hinders any innovation that would lead to product design differentiation. Recent changes in the operating environment for utilities have made management more short-term focused and less willing than in the past to pay a premium for superior products, even at the cost of long-term benefits (e.g. increased product life). Anecdotal evidence suggests that customers' propensity to pay a
premium for a higher quality product is low. A few design initiatives to improve the product have been undertaken in recent years. In one case DTM was able to introduce new materials into the design of the transformer that would prolong its life. Though the value was there, it was hard to sell cost sensitive utilities on the benefits of a more expensive transformer. DTM has since abandoned that project and as a result made only limited efforts to achieve design further design innovations. Instead, focus has been shifted towards design for manufacturing (DFM), where cost reductions may be achieved and production cycle time reduced.

3.5.3. Capital requirements

Manufacturing processes require substantial capital investment in manufacturing equipment. Nevertheless, these are by no means prohibitive. Large firms' entrance through acquisition of small players is well within reason. The reentrance of a major manufacturer into the distribution transformer market through its holdings in a competitor outside the US corroborates this assertion. Additionally, significant portions of the product manufacturing may be outsourced to contract manufacturers, thus relieving further the to invest in dedicated capacity.

3.5.4. Switching costs

There are effectively no switching costs in the distribution transformer industry. Because product complies with customer's technical specifications, products manufactured by different suppliers are interchangeable. It is in fact common practice in the industry for customers to put orders out to bid on an order-by-order basis. Prevailing "arms length" relationships between manufacturers and customers in the industry support a business environment that further reduces switching costs.

3.5.5. Cost disadvantages independent of scale

The distribution transformer is a mature product. Technologies that contribute to the design and manufacturing of the product are well known. Very few proprietary technologies are in use in the manufacturing of this product. When those are present, they are typically found in the manufacturing processes and not in product design.

Domain specific knowledge and experience does factor into product design and manufacturing process to a noticeable extent. While some manufacturers are able to produce a fairly consistent quality product, others have struggled with quality issues. Consequently these
quality issues have hurt their reputation and market share, as competition quickly picked up frustrated customers. Nevertheless, in this mature industry, experience cannot constitute a viable competitive advantage. Being further out on the experience/learning curve does not create a sustainable competitive advantage in stagnant industries. Maintaining an advantage through faster innovation and learning is next to impossible when little product innovation takes place in the first place. Competition will catch up.

3.5.6. BTE - Summery

The distribution transformer industry can be characterized as having moderate to low barriers to entry. The product has evolved in such a way that severely restricts any opportunity to differentiate based on design. As such, all products are perceived the same and no manufacturer has any distinct or unique advantage. Capital expenditures required to setup an operation and scale required to justify the investment are fairly high. Nevertheless, a developed contract manufacturing market coupled with the generic process technologies required to manufacture the product, make outsourcing a realistic options that allows potential entrants to circumvent the capital expenditure and scale issues.

3.6. Substitutes

The distribution transformer has no real substitutes in the market. The product is designed into the electrical distribution networks of utilities and in many respects is integral to that design. Historically this has driven a business environment where customers define product specifications and OEMs manufacture to those specifications.

3.6.1. Future Technologies

Distributed generation is a growing part of the restructured electric power industry. It is broadly defined as small generators located near or at the consumer site, within the distribution system. Distributed generators do not have to be directly connected to the transmission grid. The amount of power generated in a distributed fashion is expected to increase in the future, with the technological and economic improvements in small generators. Fuel cells and photovoltaic systems are the most promising technologies for delivering distributed power. They are becoming more available as alternative or supplemental power sources.

Net metering arrangements are being offered to consumers that install distributed generation units using renewable resources at their homes or businesses. The owners may use all
or most of the power produced, but at times the distributed generator produces more power than
the owner uses, and excess power flows out onto the distribution system. The consumer’s meter
“runs backwards,” and “nets out” the portion of the electricity delivered to the consumer.

Though these trends may impact the market for generation and transmission, it is
expected to do so only in a marginal way in the foreseeable future. In all likelihood the
distribution market will remain unaffected because consumers will need to remain on the
distribution network to offload excess capacity back to the network.

4. Establishing the need for a new business strategy

4.1. Deregulation in the Electric Power Industry

4.1.1. Competitive business environment

Electric utilities are coming under increasing pressures from various sources to become
more competitive across all functions. While in pre-deregulation days utilities would just pass on
to their rate base any and all costs, the regulatory environment today is much different.
Competition in power generation has changed the mind set and business environment for the
entire sector. Within the electric utility industry the electricity distribution function is also
coming under pressure as performance-based regulatory thinking is setting in. With utilities
becoming more cost conscious, the competition among suppliers for their business intensifies.

In response to the new needs of electric utilities to become efficient and competitive,
wholesale electrical distributors have begun to tailor products and services that address those
needs. As a result they have begun wedging themselves between the manufacturers and their
customers with various types of services that position them to “capitalize on the growing
customer demand for value-added services and procurement outsourcing...” 12 Continuing on
that path, distributors will gradually gain power with both manufacturers and customers. While it
is difficult to determine what the specific implications of that may be, it is clear that
manufacturers, as well as customers, will lose some of their decision flexibility and margins as
they are subjected to the goals and interests of a third party.

In response to deregulation and the increased competition in the electric power industry,
investor-owned utilities (IOUs) have engaged in a wave of mergers and acquisitions. From 1992
to April 2000, 35 mergers or acquisitions have been completed between IOUs or between IOUs

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and IPPs (independent power producers). The size of IOU mergers, in terms of value of assets, is also increasing. Between 1992 and 1998, four mergers were completed in which the combined assets of the companies in each merger were greater than $10 billion. Between 1999 and 2000 eight mergers were completed or were in the process of completion, with each having combined assets greater than $10 billion.¹³

Recent mergers between IOUs or between IOUs and IPPs are motivated by the desire to increase power generation capacity and/or transmission and distribution capacity in order to leverage economies of scale. By combining resources and eliminating redundant activities, larger companies hope to benefit from increased efficiencies in procurement, production, marketing, administration, and other functional areas that smaller companies may not be able to achieve.

Whereas utility executives argue that a merger or acquisition will improve the efficiency of the combined company, experience suggests that efficiency improvements are not guaranteed. One study reported that only 15 percent of mergers and acquisitions achieved their expected financial objectives. Incomplete or under-developed plans to integrate the companies was noted as a major factor for not achieving the objectives.¹⁴ As a result, electric utility executives are coming under mounting pressures to deliver the projected savings. Those pressures resonate throughout the utilities' operations and onto their supply chain. Ironically enough, suppliers inevitably "feel the heat" from both successful and failed mergers. Successful mergers usually yield large customers with substantial bargaining power. Failed mergers yield large customers with substantial bargaining power and an urgent need to demonstrate cost savings.

4.1.2. Performance Based Rating

Industry critics have argued that traditional utility regulation, in which rates are based on the cost-of-service, plus a risk component, does not give utilities an adequate incentive to become efficient. As a result, many states have begun examining the need to reform the cost-based regulatory framework.

Incentive-based ratemaking, also known as performance based rating (PBR), provides an alternative to cost-of-service ratemaking. Through incentive mechanisms, utilities are given

¹² Wesco Distribution Inc. SEC filing
performance targets. If the utility exceeds its target, it will share all or part of the resulting benefits through increases in its allowed return on equity. Examples of PBR schemes include the following:

Revenue sharing. This method seeks to compensate a utility for investments in efficiency creation and cutting costs. The utility is assured that benefits resulting from gains in productivity or efficiency are shared between customers (in the form of lower rates) and utility shareholders (as higher earnings). Revenue sharing is currently used by some electric utilities in New York and California.

Price-cap regulation. This type of regulation employs price caps, which allow individual utilities discretion over all investments and operating decisions. Under this form of regulation a consumer price ceiling / price cap is determined by the regulating body. The price cap is intended to cover a "reasonable" cost of service, while letting utilities choose the most efficient way to provide that service. In contrast to cost-based regulation, utilities realize all the gains from efficiencies achieved beyond the established benchmark up until the next regulatory review, when new benchmarks are established.\textsuperscript{15} Price cap regulation has been successfully implemented in the United Kingdom.

Under both PBR schemes, utilities are compensated for efficiencies. As a result, they will begin to actively seek efficiencies and cut cost. Reducing the cost of procured goods is one avenue that will not be overlooked by savings hungry utilities.

4.1.3. Implications

As a result of the various changes brought about by deregulation and competitive thinking in the electric utility industry, a reassessment of some of the fundamental drivers of the industry is called for.

Deregulation has brought with it a way of thinking that will intensify cost pressures on distribution utilities and in turn on their suppliers. Historically utilities have been able to capitalize equipment as it went into their inventories and pass it on to the rate base immediately. There was no incentive to manage inventories. Only service levels mattered. Years of operation in a highly regulated environment that guaranteed returns for electric utilities have resulted in inefficiencies. Though deregulation has targeted mostly the generation and transmission

segments in the electric power industry, the distribution function has not remained unscrutinized. In recent years regulators and legislators have begun to look at regulation that will demand efficiencies from the distribution utilities and not only service. Regardless of whether that demand will translate into explicit regulation, or remains implicit, it is sure to “light a fire” under the distribution utilities to streamline their operations and cut costs.

Performance-based rating (PBR) and other regulatory policies designed to create operational efficiencies will translate into increased pressures on suppliers to electric utilities, including distribution transformer manufacturers. Various performance-based rating schemes under evaluation today are designed to create explicit incentives for utilities to cut costs. Such new regulatory policies are being realistically discussed by legislators and regulators as a possible next step in introducing efficiency and reducing consumer price in the electric utility industry.

The expansion of the services offered by wholesale electrical distributors offers anecdotal evidence that third-party distributors are beginning to gain more power in the supply chain. As electric utilities look for solutions that produce cost savings and promote operational efficiencies, wholesale electrical distributors have begun to tailor products and services that address those needs. As a result they have begun wedging themselves between the OEMs and electric utilities with various types of third-party logistics services. Growth experienced by wholesale electrical distributors suggests that such relationships are successful and gaining momentum. As third party logistics providers gain traction in this market, both utilities and manufacturers will be forced to deal through a third party and thus forego margins and control.

Additionally, third-party service providers will further diminish the distribution transformer manufacturers' ability to differentiate their product in the eyes of the distribution utilities. Such service providers come in place of the direct supplier-customer relationship. Distribution transformer manufacturers will sell product to 3PLs. They in turn will resell product to distribution utilities. The loss of direct relationship with end customer will reduce manufacturers' bargaining power. Product supplied through third-party sales and distribution channels will lose any differentiation that might have been attributed to the distribution channel. For instance, OEMs that have historically had superior distribution capabilities and were able to supply product with shorter delivery time would be at par with weaker suppliers, as all product flows through the 3PL’s uniform distribution channel.
Deregulation has brought with it a trend for consolidation. Utility executives expect mergers or acquisitions to improve the efficiency of the combined company. The frenzy of M&A activity will result in larger utilities having increased bargaining power with their suppliers. Mergers that fail to materialize the expected savings will create even more aggressive utility procurement policies aimed at compensating for savings that did not materialize from the merger.

As vertically-integrated electric utilities are forced to achieve functional separation, the true costs associated with each functional business will be revealed. Arbitrary allocations of joint/common costs between the various utility functions prevalent before functional separation are likely to have caused cost allocation distortions. This may lead to a significant revision of existing cost estimates by electric utilities. It is not clear how accurately the distribution function has been bearing the costs associated with it over the years. Mispricing of the separate products and services provided by electric utilities might be uncovered. With rate of return regulation still prevalent, mispricing uncovered by the unbundling of costs might create a costing gap. Regulated returns will remain the same and the true costs associated with distribution might be too high for utilities to operate profitably. In order to close the gap, some pressure will undoubtedly fall on regulators to adjust the rate of return. Some will inevitably fall on the utilities to cut costs.

DTM should therefore look to differentiate its product so that it does not compete on price alone. Competitors operating in low-labor cost regions will have a significant cost advantages compared to DTM. Labor accounts for roughly 16% of product manufacturing cost, putting manufacturers from low-labor regions (like Mexico) at a significant labor cost advantage. DTM will find it difficult achieving competitive product prices. While logistics costs associated with importing/exporting products are significant due to the size and weight of the transformer, countries like Mexico are located sufficiently close to potential markets (the US market) in order to successfully exploit labor cost differences. Europe also offers some examples of low-labor regions that are sufficiently close to potential markets (i.e. Poland as potential low-labor region to manufacture transformers for Western Europe). Additionally, distribution transformers are produced to customers' specifications. Most manufacturers are capable of manufacturing to those requirements. Product differentiation based on brand has eroded to a point where the only
product differentiation factor is cost and sometimes delivery time. As a result, new product strategies must be devised to avoid an intensely price-competitive business environment.

Fulfillment lead-time may be used as a differentiating factor only to a limited extent. The fundamental nature of the construction and electric utility industries (slow processes, planned activities) does not require overly responsive manufacturing systems to effectively address demands. Consumption/deployment of distribution transformers by utilities and contractors, excluding emergency replacements, is a rigorously planned process. The construction industry has historically had long planning cycles, as a result of various regulatory issues and the inherently slow processes prevalent in that industry. There are no “impulse buys” and very little unplanned consumption. The exception to this claim is the replacement of failed units. To address the emergency market, safety stock must be deployed close to the demand, so that failures may be addressed in a timely manner. No realistic order fulfillment lead-time will ever be sufficient to address that need. Stocking replacement units will be necessary. Fulfillment lead-time required to meet customer demand (excluding emergency replacement units) may be significantly lengthened without any inventory increases if effective joint planning mechanisms are put in place between utilities and their suppliers. It may therefore be concluded that significant gains may be realized through inter-company communication of information (e.g. collaborative planning and forecasting).

The electric utility industry has undergone fundamental changes. Regulators have initiated fundamental deregulation activities designed to promote competitive efficiencies. Power generation is currently undergoing deregulation. Incentives based regulation schemes (PBR) are being devised to promote efficiencies in power distribution and transmission. As a result, cost pressures on electric utilities will increase and propagate throughout the supply chain to their suppliers. Consolidation brought about by deregulation has resulted in a frenzy of M&A activity. Successful mergers will result in larger utilities having increased bargaining power with suppliers. Mergers that fail to materialize the expected savings will create even more aggressive utility procurement policies aimed at compensating for savings that did not materialize from mergers. Third-party service providers, such as wholesale electrical distributors, are actively pursuing electric utilities seeking efficiencies in the new competitive landscape. As their efforts gain traction, bargaining power of suppliers to electric utilities will further diminish and efforts to differentiate products will be further limited.
4.2. Information Technology

4.2.1. Advances in information technology

Advances in information technology have created new opportunities in managing the supplier-customer relationship. Supply chain integration has become a reality that offers value to all partners in the supply chain. Information technology is a key enabler for such integration. New business channels and relationships are evolving on the Internet. From point-to-point EDI connections, to business-to-business exchanges, to virtual private networks, suppliers and customers are realizing efficiencies through information technology.

New business models and strategies are just beginning to unfold and mature. Successful Internet strategies are still illusive and unclear. Nevertheless, it is expected that much of the business transaction between customers and sellers will migrate to the Internet. Companies will leverage the lowered transaction cost and higher efficiencies offered by the Internet medium. Several initiatives currently underway to establish trading exchanges are only beginning to sort out their business models and gradually gain traction. Though most of these initiatives have still a ways to go before truly reshaping the industry's business processes, absence from the channel will inevitably lead to loss of business, as more business is conducted through these mediums.

New advances in information technologies and the advent of the Internet have allowed for cheap and effective inter-enterprise communication of business data across virtual supply chains. In the distribution transformer industry specifically, IT can be used effectively to leverage benefits from long planning cycles on the customer side to reduce manufacturing cost and increase product availability on the supplier side. Utilities seeking improved efficiency in purchasing processes will find compelling answers using information technology.

Increased visibility and price transparency created by cheap and effective means for information dissemination, such as the Internet, will inevitably lead to increased price transparency, which in turn will lead to increased price pressures. Business strategies to deal with these pressures must be devised. In order to effectively deal with these potential pressures, manufacturers will need to achieve cost leadership or be able to differentiate their product in a compelling way.
4.2.2. Legacy systems - Legacy thinking

The distribution transformer industry has been around for decades. Up until recently it has enjoyed the spill over effects of conducting business with regulated monopolies that provided a forgiving business environment. Very little innovation in product design and supply chain management has occurred. The revolutionary advances made in information technology in recent years combined with the deregulation of the electric utility industry have created the need and opportunities to redefine the business.

Information technology systems that were put in place decades ago are today hindering the next phase of evolution of the industry. Today, legacy systems induce legacy thinking in companies' supply chain management practices. Outdated IT capabilities are defining business practices and relationships, instead of business needs defining IT capabilities. Over the years the industry has experienced an erosion of talent and budgets in IT departments that resulted in stagnation of IT thinking and technologies.

The prevailing legacy thinking in the industry poses both a threat and an opportunity. As the industry becomes more competitive and product increasingly commoditized, manufacturers may choose to resign to a business as usual, "this is how we've done it for years" approach. Conversely, they may commit to leveraging new advances in information technologies to achieve a true competitive advantage.

4.2.3. Implications

Information technology, and the increased price transparency it will bring with it, will further commoditize the distribution transformer. As technology advances, new business models will emerge. Online market places and exchanges will facilitate a highly competitive business environment, with greater information transparency between customers and sellers.

Advances in information technology have created new opportunities in managing the supplier-customer relationship. Effective communications can replace costly supplier responsiveness to customer demand. With the deployment of distribution transformers being a rigorously planned process (except for emergency replacement), planning horizons for the industry are relatively long. The fulfillment lead-time required to meet customer demand may be significantly lengthened without having to experience inventory increases if effective joint planning mechanisms are put in place between customers and their suppliers. Short fulfillment lead-time may be replaced with collaborative planning and forecasting systems/processes.
5. Deregulation – Lessons from the United Kingdom

The regulatory reform and restructuring of the electric utility industry in the United Kingdom offers some interesting insight into how deregulation in the U.S. might unfold. While reform in the U.K. occurred in a larger context of privatization of the formerly state-owned electric utilities, the end result bears the same characteristics of the reform unfolding in the U.S.

In the 1980s U.K. legislators sought to deregulate and then privatize the generation and marketing of electricity, while keeping the transmission and distribution as regulated, privatized local monopolies. Regulation of those monopolies was to take a new form also. The traditional rate-based regulation would be replaced by performance-based rating paradigm. While the specifics of deregulation of the generation and marketing of electricity in the U.K. is largely beyond the interests if this paper, the reform in regulation of the distribution utilities may provide some useful insight.

Prior to the reform in the electricity market in the U.K., rate-based regulation provided the fundamental regulatory philosophy and practice. Rate-based regulation, also referred to as rate of return regulation “…essentially allows companies to pass through those costs which are deemed necessary by the supervising regulatory body to ensure that an adequate level of service is provided to the end users. During periodic regulatory reviews, expenditures that are deemed appropriate by the regulatory body are added to the rate base. In order that appropriate levels of capital investments are undertaken, supervising regulatory bodies estimate appropriate rates of return for the regulated utility, based in part on the cost of capital to the utility”.

Essentially this is a cost plus arrangement that leaves virtually no incentive for the utilities to aggressively seek out efficiencies.

Following reform, performance-based rating was introduced through price caps. Price caps meant that all the gains from efficiencies achieved beyond the established benchmark went to the benefit of the utilities, and every period a new benchmark was established by the regulating body. This rate structure provided utilities with a stronger incentive to reduce costs, because the utilities themselves realized all the benefits created through cost reductions.

"The United Kingdom's regional electric companies (RECs), having operated under regulatory price caps since their privatization, were jointly valued at £15.9 billion in late 1994,

more than three times their market value at flotation in 1990. The scope for additional value creation in these companies is reflected in the premiums several have attracted in recent bidding wars.\textsuperscript{17}

Overall the reform in the U.K. was viewed as a success and achieved its goal of introducing efficiencies to the electric utility industry as a whole. Because regulation reform coincided with the privatization of distribution utilities, performance benchmarks mandated by performance-based rating were not as aggressive as they could have been. To make the distribution companies attractive for sale, benchmark performance levels were set so as to allow for the profitability of those companies and their ensure attractiveness in the eyes of potential investors. This resulted in pragmatic benchmarking, as opposed to aggressive benchmarking. Nevertheless, regulation reform in the U.K. was considered a success. Performance based rating was successful at creating cost reduction incentives for the distribution utilities.

6. Foundation for a new business strategy

6.1. Industry competition

Distribution transformer manufacturers are jockeying for position in the transformer market, where differentiation is achieved mainly through product price and order fulfillment lead-time. They are all making efforts to rationalize their internal operations to achieve the efficiencies needed to successfully compete on price and order fulfillment. While these processes are taking place on the manufacturing side, wholesale electrical distributors are positioning themselves to become long-term solutions providers to electric utilities. They are beginning to wedge themselves between the manufactures and the customers in an attempt to control the distribution channel using various supplier managed inventory schemes.

DTM has been operating in a make-to-order/make-to-stock production environment, much like other distribution transformer manufacturers. Most orders are produced based on certain orders and delivery dates. Customers promised shorter lead times have been typically serviced from stocked product. Operating in a purely make-to-stock environment is prohibitively expensive because of the immense variations in product design and the inventory costs associated with holding inventory. Operating on a pure make-to-order policy is prohibitively
expensive also. The investment required in flexible manufacturing capacity that allows for the production of small, possibly one unit batches, and in addition enables the operation to respond to demand variability, makes a true make-to-order production policy unrealistic. Additionally, distribution costs are likely to increase considerably, as shipping of economical truckloads (TL) is replaced by expensive, expedited less-than-truckload (LTL). The expensive equipment required, the low utilization likely to result from the need to accommodate demand spikes, and the increase in shipping costs will result in substantial increases to total product costs. As a result, a hybrid strategy has evolved where most orders are produced on a make-to-order basis, with generously long delivery lead times quoted. For high service level, short fulfillment lead-time customers, the manufacturer stocks product and orders are supplied from inventory.

6.2. Value of Shared Information and Collaborative Planning

Distribution transformer customers lump their demand into "logical" ordering quantities. This lumping is most likely driven by economics of transportation costs, order processing costs, volume discounts offered by manufacturers and customers' bargaining power with manufacturers. The resulting demand patterns experienced by the manufacturer is lumpy and provides little hint of the actual pattern of consumption driving orders. While actual end-user demand may be fairly stable and level, demand experienced by the manufacturer is often erratic. Balancing workload for manufacturers becomes increasingly difficult under these circumstances. With limited capacity at their disposal, manufacturers need to balance workload in order to meet their capacity constraints and quoted order delivery dates. As a result, more often than not, manufacturers backlog orders. To meet response time/lead-time obligations made to strategic customers, manufacturers stock product for those specific customers and supply orders from stock. Because product is typically customer specific, stocking is very inefficient and costly. More often then not demand for distribution transformers is planned well in advance. The distribution utilities and contractors that install distribution transformers have long planning and execution cycles that allow usage to be anticipated well in advance. With planned consumption information at hand, manufacturers can produce product just-in-time for its consumption, thus bypassing the need to speculate and stock. In addition, they are able to manufacture product models that will actually be in demand, instead of relying on inaccurate forecasting.

17 William J. Heller, Paul J. Jansen, Lester P. Silverman "The New Electric Industry: What's at Stake", The
New technologies available today offer tremendous opportunity to improve the design and management of supply chains. They allow for easy integration of systems and processes that facilitate the exchange of information and collaboration in planning. Information allows suppliers more freedom to level their workloads, consequently allowing manufacturers to defer costly investments in additional capacity and flexibility. Other benefits might be gained from better tactical planning of manufacturing and shipping schedules.

6.3. Inventory and Distribution Management

Wholesale electrical distributors provide a service to both their utility and contractor customers. They stock products their customers need and supply it on demand, within a short time period. The availability provided by the distributors relieves utilities and contractors of the need to stock product themselves and manage its delivery to the point of its installation.

While the value of the distribution channel is well understood, its effectiveness for custom-made products that are consumed in a rigorously planned fashion is questionable. Very little can be gained through inventory pooling because there is little commonality among transformers and across customers. Stocking to cope with demand uncertainties offers little gains because product needs can be planned well in advance more often than not (except for emergency replacement). Wholesale electrical distributors role in the case of distribution transformers is therefore limited to creating transportation economies, saving overhead costs associated with inventory management and providing a service for utilities looking to outsource their logistics, rather than deal with it in-house.

A direct distribution channel supported by joint planning and forecasting processes can potentially out perform the distributor channel. Though the direct channel is the prevailing practice in the industry, wholesale electrical distributors are appearing to be gaining traction with third party logistics services offered to their customers. Since there is no apparent advantage for 3PLs in delivering distribution transformers to the market, better management of the relationship between OEMs and their customers can produce more compelling efficiencies than going through a third party. By employing joint planning processes, effective anticipation of demand can be achieved and used to drive just-in-time manufacturing policies. Efficient management of
the distribution channel will prevent the entrance of third parties between the OEMs and their customers.

7. Achieving competitive advantage in the distribution transformer market

"The design and assembly of capabilities in the supply chain is the meta- or inner-core competency on which firms most need to focus.” Prof. Charles Fine, Sloan School of Business, MIT

7.1. Conceivable business strategies

7.1.1. Existing strategy

DTM's existing strategy is designed to compete on the dimension of order fulfillment lead-time, while maintaining par with its competition on price. Driven partially by a corporate level vision of "speed", DTM has devised a portfolio of projects designed to achieve the corporate goal of receiving orders, designing, building and shipping transformers all within a short cycle.

The basic premise underlying the "speed" strategy is that on an historical basis inventory costs make up roughly 25% of the product ownership costs while transportation makes up 4-5% of that cost. As a result, it is deemed by some in the organization that it is better to ship more frequently than stock product. In line with this rationale, the vision of "speed" was devised and a set of "speed" enhancing projects contrived.

Product quality remains a stated goal, albeit not one that results in any significant undertakings. DTM is currently leading its market on the quality dimension. Though clearly a selling point for DTM, quality is rarely a decisive factor for winning business. It is more often than not a criterion that is used to penalize a manufacturer when it is missing, and seldom commends a premium when present.

Product design innovation has been somewhat left out of DTM's strategy in recent years. Past experiences suggest that myopic, cost-conscious distribution utilities are not willing to pay a premium for better, more reliable, longer lasting products. DTM experimented with the use of new, more durable materials for the manufacturing of distribution transformers. This initiative yielded a transformer with a longer operational life. The new materials required to build the improved transformer increased manufacturing cost, and therefore required a higher selling
price. Though the overall expected cost of ownership throughout the life of the transformer was expected to be lowered, the purchase price was higher. DTM failed to market the improved product. Myopic, cost-cutting electric utilities were unwilling to spend the additional money upfront and unreceptive to the lowered cost of ownership argument made by DTM. Since then, design projects at DTM aimed at improving the quality of the product were limited to incremental improvements, none of which are expected to yield any significant breakthroughs in the foreseeable future.

Price leadership might be regarded as a losing proposition for DTM. Historically this was not DTM's forte. DTM is a quality leader. Currently, quality in the production process is being sought as a means to reduce production costs associated with rework, but is not expected to yield any dramatic cost advantages for DTM. Making the shift from quality leadership to cost leadership will be most difficult in light of low-cost competitors emerging in low labor cost regions like Mexico and existing cost structures that render any dramatic reduction in product price prohibitive. As a result, division management is focusing on the dimension of fulfillment lead-time as its differentiating quality.

DTM is currently the market leader in order fulfillment lead-time. It is well positioned to maintain its manufacturing lead-time advantage in the near future. Several investments in manufacturing equipment will come to fruition in the near future and help DTM maintain its lead-time edge. Nevertheless, this advantage is likely to erode as lagging competitors catch up. Transformer customers are also expected to improve on their current planning processes. Once they get a better handle on their internal planning processes, their reliance on short fulfillment lead times to offset planning inadequacy will be diminished.

7.1.2. Proposed strategy

Deregulation has presented new uncertainties that threaten to revolutionize the business environment for distribution utilities with the gradual introduction of various performance based rating schemes. The product space for DTM is becoming increasingly commoditized. Customers have become myopic in their decision-making and are no longer willing to pay a premium for quality in a product that is perceived as a commodity. They are therefore becoming increasingly price sensitive. In addition, advances in the technology space, specifically information technology, are enabling firms to redefine their supply chain relationships, and seek out gains through better information exchange with their trading partners.
In evaluating its strategy, DTM should seek to break away from traditional transaction price minimization strategies and instead focus on addressing a broader notion of product ownership costs. Effectively identifying and quantifying the different costs and savings associated with a given business relationship is a necessary prerequisite to realizing value from those relationships. DTM must identify ownership costs associated with its product and craft a business strategy aimed at reducing those costs. While in the past DTM has failed in making such proposition, as was the case with the cellulose free transformer, any future breakthroughs will require a coherent and convincing business case.

To capitalize on the new opportunities that have emerged in the distribution transformer business, and address the new threats brought about by the changes that have taken place in that industry, DTM might adopt a captive supplier business strategy. Under this proposed strategy DTM will work to achieve exclusive relationships with their customers. Achieving such relationships will allow DTM to break away from the prevailing cost paradigm and establish a differentiated product strategy and a competitive advantage for itself.

Becoming a captive supplier requires that DTM establish a relationship that is relationship based and hard to exist for the customer. A powerful way to create such a relationship is through collaborative planning and forecasting. To date, the ability to collaboratively plan and execute inter-company material flows and manage supply chain inventories received relatively little attention from both customers and manufacturers in the industry. Such collaboration can potentially yield new efficiencies that may be exploited by DTM and provide a foundation for establishing long-term, exclusive relationships with it customers. The business and academic literature is filled with case studies of companies from other industries that have managed to create substantial value through effective collaboration with their trading partners.

In addition to establishing collaborative relationships with its customer base, DTM should consider the bundling of value added engineering and logistics services that are typically consumed in conjunction with the sale of a distribution transformer. One domain of services that will most likely find a receptive market is logistics services. DTM could design a solution proposition that would deliver distribution transformers to installation sites, and deploy the technical teams to install the transformer. Customers would no longer need to handle the transformers in their distribution networks and manage the coordination of merging the product
and technical teams in the field. They would outsource that activity to DTM, who would offer to sell a working transformer, instead of a “box”. This could make up a unique offering that will differentiate DTM in the marketplace. Bundling product and service will create additional revenue and increase customer dependence on DTM, which will help ensure those revenues are sustained.

Efficient and effective delivery of these complex product/service offering and collaborative planning processes will require substantial cross company communications. Information systems integration is a trivial yet critical first step to achieving a meaningful and valuable exchange of information between suppliers and customers. The exchange of information across the different trading partners' systems is a crucial precursor to any meaningful collaboration. Once the ability to effectively exchange information is established, inter-company processes may be designed to promote efficiencies in planning and execution of trading transactions. So long as value is realized through the proposed relationship, severing the relationship becomes both difficult and counterproductive for customers. This is the type of "stickiness" that locks in customers and ensures future business.

While achieving exclusivity is desired by any and all manufactures, the ways to achieve it are not always obvious or easy. Customers must be convinced of the value to be gained from exclusive dealings with one supplier as opposed to competitive dealings with many. It is therefore vital to design and articulate a relationship that provides value to both parties; value that at the very least offsets the value lost from eliminating a competitive trading environment. Success will require that DTM devise ways to provide value to its customers; value that will justify collaboration and exclusivity.

Superior supply chain capabilities driven by collaborative relationships can potentially become a proactive marketing tool/weapon for DTM, with which it might differentiate itself in the eyes of customers. While the rest of the transformer OEMs continue to compete away their rents in traditional price warfare, DTM could reposition itself to break away from that paradigm.

7.2. Discussion of alternative strategies

The power industry is a state of flux. Recent changes in the business environment for the electric utilities have transformed them into more competitive, cost-conscience customers. These trends will inevitably induce a more cost-competitive business environment for suppliers. As a result, the commoditization of the distribution transformers will most likely increase for
manufacturers. Propensity to pay for long-term value that is inherent to a high quality product will be further diminished, as electric utilities adopt short-term profitability goals. As product brand is devalued, value will migrate to other links in the supply chain. The distribution channel will most likely become an increasingly important link in the supply chain as customers seek operational efficiencies to lower costs. The growth of wholesale electrical distributors in recent years provides evidence suggesting that value is in fact migrating towards the logistics of transporting, stocking and installing transformers. Merger and acquisition activities further aggravate the situations, introducing additional pressure to streamline business operations and creating customers with increased bargaining power.

Mounting cost pressures seem an inevitability. In the short-term, vertically-integrated utilities will feel competitive pressures from the deregulated generation and distribution segments of the business. These pressures will most likely reflect on the entire business. As utilities scramble for ways to cut costs and become competitive in electricity generation, the distribution business will undoubtedly feel some of those pressures. Nevertheless, as the dust settles and functional separation of the generation, transmission and distribution functions is achieved, it will become apparent that the distribution segment will in fact remain a highly regulated entity. Regulation will continue to govern this business as it has for decades, but in a different way. Down the road, temporary pressures from deregulation are likely to be replaced by long-term pressures applied by regulators through various performance-based rating schemes (PBR). Uncertainties associated with deregulation processes affecting the electric utility industry as a whole, coupled with the seeming inevitability of PBR regulation for distribution utilities, provide an opportunity for suppliers to rethink and redesign their relationships with their customers.

The strategic goal for DTM should be to break away from the price sensitive, transactional-relationships with its customers and instead develop long-term cooperative relationships (see figure 2). In doing so, DTM will be able to create and capture more value in its transactions with its customers. While this type of business relationships do not seem to exist yet in the distribution transformer industry, prospects for its development seem promising.

Figure 2
Operational competence has proven to be a valuable differentiating factor in distribution transformer purchases to date. Achieving short fulfillment lead-time creates value to customers by relaxing their planning constraints and reducing inventory levels needed to support variability in their operations. DTM is currently a market leader in order fulfillment lead-time and enjoys a competitive advantage by virtue of its responsiveness. Provided DTM invests efforts and continuous work to further improve fulfillment lead-time and "stay one step ahead of the competition", this is a viable, defendable, short-term strategy. Nevertheless, this strategy has only limited long-term effectiveness for the reasons presented in the paragraphs to follow.

The consumption of distribution transformers may be classified into three distinct categories; planned project work with relatively long planning horizons, unplanned usage driven by lack of effective planning, and emergency use for replacement of failed units. Planned projects needs may be adequately addressed with appropriate planning and a relatively long fulfillment lead-time. With demand planned well in advance, manufacturers can plan their

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18 Relative refers to the utilities' and contractors' planning lead time relative to order fulfillment lead time.
production to meet delivery due date, without tightly constrained production lead-times. Meeting emergency replacement demand from production is next to impossible. Lead-time required to meet these needs is prohibitively short and does not provide a reasonable response time even under the most favorable circumstances. Product must be stocked and deployed near demand points to meet demand of this nature. This requires electric utilities to stock replacement transformers. Minimizing fulfillment lead-time is an effective strategy only for unexpected usage generated by poor planning. Responsive manufacturers enjoy a competitive advantage under such circumstances. Customers benefit from short lead times in such cases because they are required to stock fewer units to meet their demand needs.

While the need for fast response time is of clear value in today’s business environment, it is not necessary if effective planning processes are put in place. Because consumption of distribution transformers is generally a planned process, and because electricity infrastructure expansions and upgrades have long planning horizons, it is likely that the lower bound for effective fulfillment lead-time is forgiving for OEMs. Once an effective lead-time to support planned operational needs is achieved, there is little value in continuing to shorten it further.

In recent years the industry as a whole has offered only minor modifications to the product design. While advances in materials science suggest there might be opportunities to introduce newer, more resilient materials that would improve the performance and lifespan of the transformer, anecdotal evidence suggests that electric utilities are unwilling to pay a premium for such performance. A very telling example is the cellulose free transformer developed by DTM. The proposed use of new, more resilient materials in manufacturing transformers offered longer operational life for a marginal increase in product price. The project was "shot down" after electric utilities expressed their unwillingness to pay more for the new design. This unwillingness to "pay extra" is most likely due to recent changes in the electric utility industry that have driven utilities to focus on short-term profitability. Investing in long-term benefits does not appeal to utility managers in today’s business environment.

It is not inconceivable that a technological breakthrough in product design does happen. Product innovation may be an effective way to achieve a true competitive advantage. Nevertheless, it is quite evident that in the new business environment that has evolved, any attempt at such innovations should bear in mind the new incentives and economics present for electric utilities. In order to successfully achieve differentiation based on product functionality, a
compelling business case that speaks to utilities short-term focus must be tailored to persuade utility customers.

Product standardization has been proposed as a means for achieving additional reductions in manufacturing costs. Historically each transformer was produced to customer specifications and all manufacturers set up production systems to support the required customization. Today, in an effort to reduce cost, manufacturers are looking to scale economies. DTM has embarked on an initiative to standardize its product design in order to try and realize some scale economies in production and engineering. Product standardization may prove beneficial from a cost perspective, but definitely an "uphill battle" in an industry that has historically been used to procuring customized products. In all likelihood, benefits from a transition to standard products must be substantial in order to entice the customer to accept engineering changes to its distribution grid required by a standard product.

A closer review of this initiative raises several other issues that significantly undermine its attractiveness. First, standardization does not seem to play to DTM strengths. After years of work and millions of dollars invested in flexible manufacturing equipment, DTM will lose this edge. The company's relative strength is in economical small batch manufacturing. Going to large batch manufacturing with the aid of standardization will simply diminish DTM's strengths. Second, with material costs comprising roughly 65% of the manufacturing costs, standardization will most likely result in an over-designed, over-built product that satisfies engineering requirements of many customers. Excess material going into this over built product may very well end up costing more than the savings achieved in production and design efficiencies. This tradeoff must be thought through carefully to assess whether the increase in material costs are in fact offset by increases in efficiencies.

An alternative approach to reducing product variation may be paring the customer base and targeting only large customers. Such customers will generate large volume of common product design and help reduce the overall number of designs while maintaining sales volume. Such an approach will achieve similar manufacturing efficiencies as the product standardization approach. Nevertheless, this does not necessarily play to DTM's manufacturing strengths.

7.3. Desirable strategy

The two evaluated strategies can be compared and contrasted across several key dimensions presented in the table below.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Existing Strategy</th>
<th>Proposed Strategy</th>
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<tbody>
<tr>
<td>Fulfillment lead-time</td>
<td>As short as possible</td>
<td>Adequate to meet customer needs</td>
</tr>
<tr>
<td>Price</td>
<td>Low transaction price</td>
<td>Low ownership cost for customer</td>
</tr>
<tr>
<td>Cost</td>
<td>Aggressive lead-time policies drive system costs (higher distribution costs, higher manufacturing costs, lower inventory costs)</td>
<td>Loose system constraints allow for proactive management of cost tradeoffs</td>
</tr>
<tr>
<td>Quality</td>
<td>Sufficient to meet customer requirements</td>
<td>Sufficient to meet customer requirements</td>
</tr>
<tr>
<td>Future business</td>
<td>Based on spot ability to generate attractive bids</td>
<td>Guaranteed by virtue of relationship</td>
</tr>
</tbody>
</table>

The basic premise for the "speed" strategy hinges on the argument that about 25% of product costs are attributed to inventory and 4-5% to transportation. Therefore, less product should be stocked and more frequent shipments should be used. A closer evaluation of this claim might reveal a fundamental flaw in the argument made. There is a well-understood tradeoff between transportation costs and inventory holding costs. As one is increased the other typically decreases and vise-versa. A change in replenishment strategy that relies more heavily on frequent shipping will undoubtedly increase transportation costs. A 4-5% cost level (of product value) is based on full truckload (TL) shipments (roughly 2-3 destinations per load). Under frequent product fulfillment strategy, product will need to be shipped in smaller quantities (as small as one unit per shipment). As a result, scale economies associated with transportation will be lost. Full truckload shipments will need to be abandoned in favor of smaller, more expensive less-than-truckload (LTL). As a result, transportation costs will surely rise. A more rigorous analysis of the problem must be evaluated before strategies are adopted. There are various analytic techniques to think through this cost trade-off problem.

In order to support the manufacturing flexibility required to respond to incoming orders within a short time frame, costly investment in flexible, scalable manufacturing capacity is
required. Investments intended to accommodate demand surges will result in excess capacity. This will lead to manufacturing assets that are under-utilized, resulting in a substantial increase in fixed overhead costs. It is questionable whether the competitive market for distribution transformers will allow product pricing to support such costly investment in excess capacity.

An alternative strategy DTM might pursue entails more effective demand management rather than responsive manufacturing. Generally speaking, effective planning processes can allow manufacturers to actively manage the cost tradeoffs associated with the manufacturing and distribution of products. DTM, like other OEMs in the distribution transformer market, has the luxury of operating in an industry where its products are consumed in what is an often a rigorously planned and deliberate process. While most other industries are forced to deal with the uncertain behavior of demand through costly inventories, flexible capacity and less than optimal distribution strategies, the specific nature of the transformer industry allows trading partners to "plan away" many of its supply chain costs. With sufficient and timely knowledge of when and where product is needed, OEMs can have ample time during which they can consciously evaluate alternatives ways they can meet customers' needs. This unique planning flexibility, if exploited properly, can allow OEMs to efficiently manage supply chain costs, thus averting the cost burden associated with designing overly responsive manufacturing and distribution systems.

In addition to promoting collaborative relationships with customers, DTM should begin looking into bundling its product with related services. One natural domain of services that might be explored are logistics related services. DTM could conceivably offer complete distribution transformer solutions to its customers by bundling the product with the logistics associated with deploying it in the field. Specifically, the activities of delivering it to the installation site and dispatching the technical teams required to set it up and get it running. DTM is a part of a corporation that certainly has the technical know-how to make such a service possible. The missing component at this point is the logistics capabilities to deliver individual units to installation sites and coordinating the process.

Breaking away from the cost-competitive product space and into a differentiated product offering is necessary in avoiding brutal price wars with competing OEMs. In the past, utilities were forgiving customers that would simply pass along any operating and investment costs to its customer base. Recent developments in regulatory thinking and policy regarding the electric utilities market have made utilities much more prudent with regards to their costs. In response to
this change in behavior, the marketplace for distribution transformers has become much more cost competitive. As margins are competed away, OEMs must figure out strategies for maintaining profitability. DTMs cost position is such that it will find it difficult to remain profitable in a price war. Its unique affiliation with a larger corporation in the business of serving electric utilities positions it ideally to bundle it products with other services. The bundling will not only help DTM to differentiate itself in the market, it will also allow it to capture higher margin service revenues associated with its products; services such as distribution and installation.

In order to enable the active management of cost tradeoffs, DTM must have adequate and timely information from its customers. Establishing real-time communications channels and suitable inter-company work processes is absolutely critical to the task. Currently very little inter-company communications occur, which suggests that OEMs and their customers have not yet realized the potential value in rationalizing their supply chains and trading decisions. DTM's corporate culture and resources make it a likely first-mover in this untapped space.

Promoting long-term, relationship-based business in an industry that is dominated by transactional relationships, requires compelling incentives for customers. Customers currently enjoy substantial bargaining power that fuels intense competition among OEMs. Identifiable value must be created to convince customers to give up their buying power and flexibility. Advances in information technology and business thinking have revealed new ways for trading partners to reduce costs and create value through cooperative, long-term relationships. Investing in such relationships would make DTM a first mover in the electric industry OEM space. As such, DTM can both differentiate its product and establish substantial barriers to entry for other players seeking to imitate such relationships.

7.4. Initial steps

During a 6-month long internship, the author was engaged in a project focused at evaluating two alternative paths for building up DTM’s outbound logistics capabilities. While the immediate objective of the project was to identify an alternative way for managing the outbound logistics needs of the division in order to attain better cost performance, one might also consider a broader picture and evaluate how the two explored alternatives might eventually be developed into logistics services that can be used to differentiate DTM’s product in the marketplace.
The first alternative explored was the outsourcing of outbound logistics to a capable third party. The purpose of this proposition was two-fold. The first was to try and leverage the economies of scale and scope associated with a large, competent 3PL. Additionally, DTM might instantly acquire capabilities that will allow it to structure logistics services for its customers based on the capabilities brought by the 3PL. Scale and scope economies, together with best practice logistics will most likely also deliver an immediate cost savings to DTM.

The second alternative explored was the implementation of a Transportation Management System (TMS) to support better decision making with regards to load consolidation, load tendering and truck routing. The current state of outbound logistics management at DTM is lagging far behind best practice. On a tactical level, processes are executed manually, in a sub-optimal manner. There is much value to be extracted from better tactical management, using state-of-the-art transportation management systems. On a strategic level, sourcing and contracting of transportation services is done on an opportunistic, ad-hoc basis. As a result, the Division is not even beginning to leverage the scale and scope of the corporation it is a part of to source and manage transportation services. With the aid of TMS, DTM might begin to address some of the tactical issues associated with logistics management in the short-run. In the long run, it might start re-thinking the way it goes about procuring logistics services and begin realizing some of the value associated with its parent corporation's size.

8. Lessons from other industries

Carrier, a United Technologies company, is recognized as the company that invented air conditioning and produced commercial chillers. For many years the company held a prominent position in the industry based on its innovativeness and quality. Over the years that position has eroded. Today Carrier has lost its leadership in the commercial chiller market and is struggling to remain profitable.

In recent years Carrier has been forced into selling their commercial chillers at a loss in order to maintain their market position. The question then arose at Carrier "why are we in this market if we lose money?" A strategic decision was made to stay in the commercial market in order to have a complete product line and to maintain the services business it generates. While they have not been able to figure out how to become profitable selling chillers, they have managed to turn the servicing of these chillers into a profitable business.
As the product was commoditized, Carrier's ability to make money from its sales was compromised. Nevertheless, the company has been able to design a suit of services to sell around the product and turn the bundled offering into a profitable business.

9. Conclusion

DTM is required to formulate a response to changes in the electric power industry. In doing so it must consider both the needs of its customers and the specific constraints that govern its industry. Relative to other industries, distribution infrastructure is one that is characterized by long lead-times and rigorous planning. Currently no transformer OEM seems to be making any noticeable efforts to profit from these characteristics. Instead they are opting to pursue a strategy of infinite responsiveness. Effective communication between customers and OEMs has the potential to significantly reduce supply chain costs by allowing trading partners more flexibility to actively manage various cost tradeoffs.

Responsive manufacturing systems are expensive. Mandatory overcapacity to deal with demand surges is often very taxing on companies' cost structures. This is especially true of asset intensive manufacturers, such as DTM.

The distribution transformer industry offers substantial opportunities to benefit from effective planning. Unlike other industries where demand is erratic and hard to anticipate, the transformer industry is far less so. Investment in planning processes in place of flexible manufacturing systems seems like a far more cost effective and reasonable approach to dealing with demand.

The marketplace for distribution transformers is intensely price competitive. DTM's cost position is such that it will find it increasingly difficult to maintain its ground in a price war. While somewhat disadvantaged on the cost side, it is in a unique position to bundle its products with other value adding services. Such bundling will help DTM to differentiate itself in the market and capture higher margin service revenues.

Combining collaborative customer relationships with the delivery of an expanded product/service offering will allow DTM to break away from short term, price driven customer relationships. Establishing long-term collaborative relationships will allow DTM and its trading partners to realize benefits inherent to collaborative decision making. DTM may also leverage such relationships to promote customer lock-in and thus establishing itself as a captive supplier.
### Major Characteristics of U.S. Electric Utilities by Type of Ownership

<table>
<thead>
<tr>
<th>Ownership</th>
<th>Major Characteristics</th>
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</table>
| Investor-Owned Utilities (IOUs)   | • Earn a return for investors; either distribute their profits to stockholders as dividends or reinvest the profits  
• Are granted service monopolies in certain geographic areas  
• Have obligation to serve and to provide reliable electric power  
• Are regulated by State and sometimes Federal governments, which in turn approve rates that allow a fair rate of return on investment  
• Most are operating companies that provide basic services for generation, transmission, and distribution |
| Federally Owned Utilities          | • Power not generated for profit  
• Publicly owned utilities, cooperatives, and other nonprofit entities are given preference in purchasing from them  
• Primarily producers and wholesalers  
• Producing agencies for some are the U.S. Army Corps of Engineers, the U.S. Bureau of Reclamation, and the International Water and Boundary Commission  
• The electricity generated by these agencies is marketed by Federal power marketing administrations in DOE (Bonneville Power Administration, Southeastern Power Administration, Southwestern Power Administration, and Western Area Power Administration)  
• The Alaska Power Administration is in the process of being privatized per Public Law 104-58 enacted on November 28, 1995  
• The Tennessee Valley Authority is the largest producer of electricity in this category and markets at both wholesale and retail levels |
| Other Publicly Owned Utilities     | • Are non-profit State and local government agencies  
• Serve at cost; return excess funds to the consumers in the form of community contributions, economic and efficient facilities, and reduced rates  
• Most municipalities just distribute power, although some large ones produce and transmit; they are financed from municipal treasuries and revenue bonds  
• Public power districts and projects are concentrated in Nebraska, Washington, Oregon, Arizona, and California; voters in a public power district elect commissioners or directors to govern the district independent of any municipal government  
• Irrigation districts may have still other forms of organization (e.g., in the Salt River Project Agricultural Improvement and Power District in Arizona, voters for the Board of Directors are apportioned according to the size of land holdings)  
• State authorities, such as the New York Power Authority and the South Carolina Public Service Authority, are agencies of their respective State governments |
| Cooperatively Owned Utilities      | • Owned by members (small rural farms and communities)  
• Provide service mostly to members only  
• Incorporated under State law and directed by an elected board of directors which, in turn, selects a manager  
• The Rural Utilities Service (formerly the Rural Electrification Administration) in the U.S. Department of Agriculture was established under the Rural Electrification Act of 1936 with the purpose of extending credit to cooperatives to provide electric service to small rural communities (usually fewer than 1,500 consumers) and farms where it was relatively expensive to provide service |

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