LUMATOR

Business Plan

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Company Overview

Lumator provides intelligent automated services that help residential electricity consumers save money, save time, and save the planet, by optimizing how they buy and use electricity. Deregulation and increasing availability of renewable energy are creating opportunities that most consumers are unable to exploit because they lack the required expertise and tools. By ignoring these opportunities, consumers are leaving hundreds of dollars on the table every year. Lumator uses machine learning technology to offer personalized cloud services that solve this consumer problem.

Opportunity

The dynamics of how electricity is generated and consumed across the United States are being disrupted by: (i) deregulation of electricity markets, (ii) increasing availability of renewable energy, and (iii) rising electricity prices.

Renewable Generation (TWh)

Residential Prices (c/kWh)
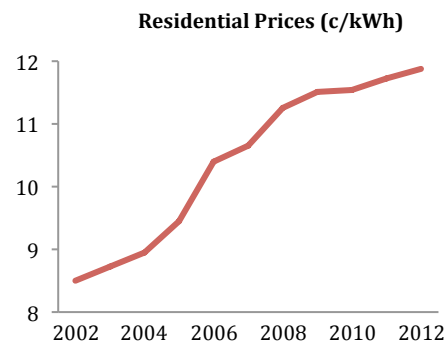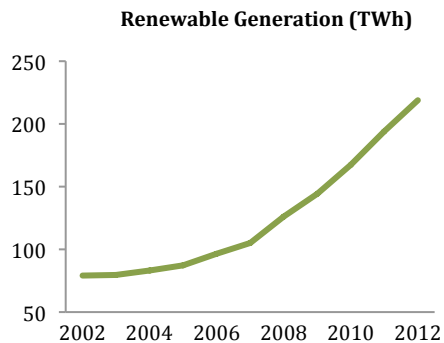
Problem

As residential consumers adopt solar panels and electric cars, they add volatility to the demand and supply balance of the electric power grid. In response most electric utilities now offer a variety of rate plans (*e.g.*, time of use pricing, critical peak rebates, dynamic pricing) that are best suited for different types of consumers. Moreover, deregulation of the electricity industry, which has firmly established itself with vibrant wholesale markets, is now trickling down to retail consumers. Deregulation of retail markets allows consumers to buy electricity from *competitive suppliers* who offer an even broader array of *rate options* to consumers. For example, in Pennsylvania and New York, consumers can choose from about 50 suppliers, each of whom typically offers more than one rate plan, which results in over 100 rate options for consumers. In Texas, consumers have nearly 300 options!

Broadly, this is a terrific opportunity for consumers to save money since most competitive rate plans offer cheaper prices than the utility does. It is also an opportunity to help the environment, since many suppliers offer plans that guarantee a certain percentage of green energy. The residential consumers that we have surveyed are all eager to exploit the potential cost savings and many would also like to make greener choices, but they also reported being overwhelmed by the number of options and their complexity. A few consumers have switched once or twice but are unhappy with the effort required or the unexpected fees specified in their contracts. Thus, consumers have for the most part ignored the opportunities. In doing so, the average US household is leaving hundreds of dollars on the table in unrealized savings every year. Furthermore, many rate plans are designed to influence consumption behavior (*e.g.*, shift electric car charging to midnight); consumers need tools to analyze their ability and willingness to adapt to those influences and to help implement them automatically.

Solution

Lumator addresses this problem by providing an intelligent automated **Rate Management** service that makes repeated rate selection decisions on behalf of residential electricity consumers. We have created AI-based algorithms and a custom simulation platform to produce learning strategies that address the consumers' decision-making challenge. These strategies automate the analysis of the available rate options, based on a consumer's preferences (*e.g.*, savings *vs.* green, fixed *vs.* variable rates) and his electricity consumption history, in order to choose the best rates for him through a personalized repeated process. Further, the service automatically executes the switch to a different supplier so that the rate management process is fully automated. An optionally integrated **Energy Management** service can implement changes to the consumer's consumption behavior so that he derives maximal value from the chosen rate. Consumers can interact with and further customize their personalized strategies through web and mobile interfaces. Nearly every potential customer that we have surveyed has said that they would be happy to let "some service" make these decisions for them, as long as their personal preferences and behaviors are taken into account.

Value Propositions

Environmental concern and cost savings are commonly presented to consumers as mutually exclusive choices. However, many suppliers offer plans that guarantee a higher proportion of renewable energy than the standard utility supply does, at a lower price than what the utility charges. Thus, we enable our customers to save money and save the environment simultaneously! Since Lumator's services constantly monitor all the available rate options and evaluate them for each specific customer, they relieve the consumer from having to worry about whether a better rate option has become available or whether the prices on their chosen rate option are about to increase. This is a significant benefit in terms of saving time and effort for the consumer.

Lumator was formed in late 2012 to deliver these value propositions to electricity consumers. While our focus is on US residential consumers, our technology is also applicable to some commercial consumers and in non-US markets. Our future vision also includes longer-term ideas for additional services such as negotiated rate contracts with suppliers and other risk management facilities. Finally, we believe our concept is transferable to other problem domains, which may offer opportunities for further growth of the company.

Market

The 2010 US census identifies 115M households in 135M housing units. We thus assume a total of 125M residential electricity consumers. These consumers represent about $140B in annual electricity spend. We include in our target market another $10B representing 5M small commercial consumers who interact with electricity suppliers in nearly the same manner as residential consumers, to obtain a target market of $150B per year.

We can deliver about 15% in cost savings or equivalent derived value from our Rate Management service alone. Assuming that we price the service such that we collect in revenues about 20% of this added value, or 3% of total spend, we obtain a *total addressable market* of $150B × 3% = **$4.5B** per year. Note however that only about 35% of the target customers live in already deregulated states with retail competition for residential consumers—they comprise our *initial addressable market* of **$1.5B** per year. Populous states such as Ohio and California are expected to allow competition for residential consumers within a couple of years, so our addressable market is growing rapidly.

Customer Segments

We divide the potential customers in our target market into two segments. The first *early adopter* segment comprising about 30% of the target customer base, are more likely to pay explicit attention to the rate selection problem. The remaining 70%, who comprise the second *mass market* segment, are less likely to actively seek our solution.

The early adopter segment is comprised of households that can be categorized as one or more of:
- Greens: Defined as households interested in energy efficiency in their homes, this number is as high as 47%. The number is growing steadily as awareness of efficiency opportunities increases.
- Techies: Defined as technophile consumers eager and willing to try new products, this number is at 29% of the population.
- Prosumers: Defined as homeowners that have solar panels, electric cars, pool pumps, and other appliances that make them more sensitive to their electricity rates, this segment is currently at about 20% of US homeowners and is growing rapidly.

At 30% × $1.5B = **$450M** per year, the intersection of early adopter households with currently deregulated states forms our *initial target segment* representing about 12M customers.

Distribution Channels

We are pursuing two sales channels, one direct and one indirect:
1. The direct sales channel is driven by the web and mobile applications, where customers subscribe to our service annually by paying through an online financial transaction.
2. The indirect sales channel bundles our services with home energy management systems (HEMS), such that we are compensated on a per-installation basis or bulk basis by the HEMS vendors.

Customer Development

The cost of customer acquisition is a critical variable in our business model. We will initially conduct experiments with various marketing channels to evaluate that cost for each channel. We will use the experimental results to select a subset to pursue aggressively as we scale our customer base. Our initial focus is on the following:

(1) <u>Customer Referrals</u>: Early adopters of our services will refer additional customers in exchange for substantial discounts on their subscription fees.

(2) <u>Social Media and Advertising</u>: We will offer some free web-based rate evaluation functionality, so we can attract potential customers to "try before they buy" using various social media outlets and targeted advertising online (Google, Facebook) and in print media (*e.g.*, AARP magazine, Sierra Club).

(3) <u>Marketing Partnerships</u>: We are in the process of developing marketing partnerships with energy management vendors who already have a footprint in our potential customers' homes, to include our service as part of a larger platform. We can also form partnerships with web and mobile applications focused on home maintenance/improvement (*e.g.*, HomeKeeper, BrightNest) and financial management (*e.g.*, Mint).

(4) <u>Viral Marketing</u>: We will launch campaigns that encourage social venues like yoga studios and coffee shops, which are also potential customers, to advertise their green credentials by posting a Lumator-branded "sticker in the window" or a "badge on the website."

(5) <u>Utility Partnerships</u>: We will also approach the PUCs and utilities to have our service mentioned on utility bills and their websites as a resource available to consumers.

Once we have acquired the customer, we will reinforce the value of Lumator's services. When they visit the web or mobile applications, we will present to them the benefits (cost savings and/or the avoided CO_2 emissions) that they have accrued since they subscribed to Lumator. For those customers that opt for fully automated solutions, since they are less likely to visit the web/mobile applications frequently, we will send them email updates, which include infographics about their accrued benefits.

Competition

Most of our target customers simply ignore the rate selection problem because they do not understand the opportunity cost, they do not have the time to make the selection, they do not have the appropriate tools, they do not have sufficient data, and/or they are not confident in the outcome of their cursory analysis. However, a small number of our target customers have selected competitive suppliers but they cannot evaluate whether they made good decisions. Another small set has chosen *100% green* rate plans often paying substantially more than the utility's standard rate. Very few of our target customers currently consider the related problem of integrating their energy management decisions with the rate selection decision; those that do tend to be highly technical and use general purpose computing tools and specialized in-home energy management devices.

Our closest competitor for our Rate Management service is a recently launched startup, Forgitit, which offers rate switching as a part of their energy monitoring service. However, they only switch

rates if the current rate goes up and only at the end of the contract period; thus they forgo significant opportunities for savings, which can be exploited by Lumator's proactive service. A second group of competitors (SaveOnEnergy, Power2Switch, CurrentChoice), have developed partnerships with certain suppliers and try to attract consumers to those suppliers by listing rate options on their websites, but (i) they only offer a small subset of the available plans (10-25%) and are therefore quite biased, and (ii) they do not make recommendations or decisions on behalf of consumers; they simply act as a portal for consumers and as a customer acquisition channel for their partner suppliers.

There are two other groups of companies that can enter our target space:
  (1) Home energy management vendors, which include energy efficiency service providers (*e.g.*, Opower, Bidgely) and smart-home device manufacturers (*e.g.*, Nest, Ecobee, EcoFactor). We are in early partnership discussions with some such providers, but some of these companies may offer their own competitive solutions.
  (2) Commercial energy procurement services including analytics providers (*e.g.*, Noesis, TheMegawattHour, kWantera) who develop tools and services for professional energy managers at commercial facilities.

Our direct existing competitors for our Rate Management service are Forgitit and, most significantly, the *do nothing* option. Forgitit, like us, is a nascent startup that launched their service only in Maryland in January 2013. Their strength is a focus on automation, like us, with their "set it and forgit it" approach. Their weakness appears to be a lack of significant technology underpinning their offering, but there is not much background information to be found on them. Their $30 per year service only switches tariffs under limited conditions and therefore does not seem to provide the most useful service for consumers. They also do not offer any personalization to consider green options.

Lumator differentiates itself through its focus on providing (i) personalized, (ii) automated and (iii) comprehensive Rate Management services. Our ability to analyze the available rate options taking into consideration the consumer's preferences for savings *vs.* green energy, for guaranteed *vs.* variable savings, and for various contract period lengths, allows Lumator to provide a more personalized service. Our ability to fully automate the prediction of rates and the associated rate selection and switching processes, while keeping the customer involved just to the extent they prefer, allows us to exploit opportunities for consumers more proactively and more seamlessly. Our ability to consider possible changes to consumption behaviors, and our ability to integrate with home energy management systems to implement such changes allows consumers to extract more value from the selected rate. Finally, since our revenue model relies on payments directly from consumers, they can rest assured that we do not have conflicting obligations to suppliers or other parties and that we are providing a completely unbiased service to the consumer.

Lumator's abilities depend on the use of behavioral machine learning techniques that:
  (1) **Learn** customers' preferences over various rate options through occasional feedback.
  (2) **Predict** future rates using historical rates and other external factors.
  (3) **Recommend** specific rates at specific times based on constant evaluation of relevant tradeoffs instead of simply listing options or choosing the cheapest fixed rate.
  (4) **Anticipate** consumption behaviors and negotiate with *semi-cooperative* energy management systems to optimize the predicted consumption pattern.

We are filing provisional patents for some key components of the technology but intend to protect it primarily as a trade secret. We have developed the technology over nearly 3 years, so it is likely to give us a meaningful head start on potential fast followers. Even though we believe that our technology is superior, we consider it very important to acquire consumer mindshare before a more recognizable brand joins the competition. Therefore, we are prioritizing an aggressive marketing and distribution effort along with an iterative product development effort.

Financials

Lumator's Rate Management service will be offered directly to residential consumers on a two-tiered pricing structure. The first tier is a fixed **subscription fee** of $12 per year, which represents about 1% of the average annual electricity spend for a typical US household. The second tier is a variable **performance fee** of 10% on realized savings to the consumer. While such price structures are not currently prevalent for most comparison-shopping services, they are common for financial asset management services such as shopping for mutual funds through brokerage accounts.

Budget-conscious consumers can save about 15% on their electricity bills relative to utility prices, *i.e.*, $180 per year for an average household. Potential customers that we have surveyed have indicated a willingness to pay up to 50% of their savings in fees to Lumator—our planned pricing structure amounts to about 20% of savings, well within that limit. Eco-conscious consumers may not realize equivalent savings, so our realized performance fees per customer will be below 10%, but highlighting that forgone revenue as a service to our community can be a good marketing opportunity.

The Rate Management service will also be offered via indirect channels such as home energy management systems providers who will pay lower negotiated prices for our service. However, the lower per customer revenues will be offset by lower costs for customer acquisition, so the earnings impact of the price differential is not expected to be significant. Lumator's Energy Management service for managing consumption behavior in integration with Rate Management provides an opportunity to up-sell and further increase the monetization per customer. We have not yet determined the pricing structure for the Energy Management service.

We have developed detailed financial forecasts (available on request) that model different rates of customer acquisition. Our expected projection, where we acquire 12M customers over 5 years, will generate revenue of about $300M per year using the pricing structure for the Rate Management service as described above. This does not include potential revenues from additional monetization possibilities through premium services and also does not discount for revenue sharing agreements that we might enter with distribution partners. At the end of 3 years, this scenario projects revenues of about $50M per year from 2M customers.

Lumator is following the lean/agile startup methodology to minimize funding requirements. Our operating costs primarily consist of expenses incurred on hiring/contracting for continued product development, rate data maintenance, customer data acquisition and analysis, customer support staff, marketing to direct consumers, partner development for the indirect channel, office facilities,

licensing and professional services, cloud hosting services, and travel expenses. We intend to grow to about 10 employees by the end of 2013. A key enabler in keeping our cost structure low is our technology, which allows us to automate most of the data acquisition, analysis, decision-making, and action-taking steps of the Rate Management process.

We are pursuing several seed funding opportunities including the McGinnis Venture Competition and the Open Field Entrepreneurs Fund at Carnegie Mellon. We also have active interest for a larger seed funding round from some angel investors and a couple of respected VC firms. Taking more funding at this stage will allow us to accelerate product development and to aggressively pursue a multi-state launch and growth strategy to capture market share.

Team

Prashant Reddy, a PhD candidate in the Machine Learning department at Carnegie Mellon University, founded Lumator in late 2012. Prashant has extensively studied Artificial Intelligence strategies for agents in deregulated electricity markets. This domain expertise is critical to Lumator's business opportunity; moreover, exploiting the opportunity also requires expertise in CS/engineering, statistics, economics, finance, and trading, which Prashant has acquired through a bachelor's degree in EECS at Berkeley, an MBA in finance from Wharton, an MS in Machine Learning from Carnegie Mellon and 12 years designing and developing software for algorithmic trading and automated trading at Morgan Stanley. At Morgan Stanley, Prashant built teams of 100+ software engineers and developed large software systems from the ground up. He resigned as a Managing Director to pursue his PhD and to reorient himself towards a more personally satisfying and exciting purpose—research in robotics and smart grid agents. That excitement continues with Lumator because it not only addresses a real and difficult problem for electricity consumers but also addresses the shared economic and environmental sustainability goals of our society.

We are also in advanced discussions to build out the core team at Lumator. In particular, we are considering two possible co-founders, who possess impressive academic credentials including CS bachelor's degrees from Columbia and Duke universities, and technical MS/MBA/PhD degrees from Carnegie Mellon. One has previous tech/finance startup experience and one has significant energy industry expertise. In the absence of a formal team currently, Lumator has been leveraging the extensive resources available through the Don Jones Entrepreneurship Center at Carnegie Mellon's Tepper School of Business, including a team of 4 MBA students and 3 design students working on various aspects of Lumator's technology and marketing deliverables.

We need to acquire significant consumer technology marketing expertise within our team. This is critical since we need to effectively explain the value of our offering to busy consumers. We are exploring various leads to fill this gap. We are also looking to hire several engineers to accelerate the development of the product. Lumator has already assembled a great set of technical and business advisors, including academic collaborators, legal counsel and fellow entrepreneurs. We will expand and formalize our technical and corporate advisory boards over the next few months.

Milestones

Although we do not yet have a user-accessible product, we have been developing the technology underlying our product for the past 3 years. The analytics for rate selection, and real rate data for Pennsylvania, New York, New Jersey and Texas, are available in a research and development environment. Packaging the technology into a product primarily consists of integrating the technology with streaming data sources for continuous analytics and also the development of web and mobile applications. We have also demonstrated the value of integrating rate management and energy management in highly respected academic publications.

We have surveyed several homeowners in Pennsylvania and New York and they have universally expressed interest in buying Lumator's service. We have conducted card-sorting exercises with some of them to identify the features in our minimum viable product. Finally, we have been pursuing funding opportunities on various fronts.

Lumator's current milestones for the next few months include:
(1) Expanding the founding team and hiring people for further product development.
(2) Formal customer surveys to further validate our initial willingness-to-pay assessment.
(3) Early functional demo of our web application and supporting services that package the underlying technology into a user-accessible interface.
(4) Collaboration with students from the Carnegie Mellon School of Design to prototype the user experience and to test various landing pages and customer onboarding workflow.
(5) Formal clearance of IP from Carnegie Mellon (already completed unofficially) and further evaluation of our IP protection strategy.
(6) Evaluation of initial funding requirements and active steps towards acquiring venture funding, assuming we pursue an aggressive product development and launch strategy.

If we were to win $20K now, we would buy hosting services so that we can collect data in a secure, scalable and centralized location and so that we can start testing the full-stack integration. We would also contract professional visual designers to start developing Lumator's brand and to produce an informational video that explains our service to potential customers visiting our website. We would use remaining funds towards travel for recruiting and partner development.

Challenges

We believe that we have validated all of our critical hypotheses regarding the technical hurdles that we could encounter for the Rate Management service. So, our biggest technical challenge is in integrating with the appliances in our customers' homes for the Energy Management service because of the diversity of appliances and the lack of common platforms or standards. Partnering with home energy management systems providers that are more focused on this problem, such that Lumator focuses on identifying optimal consumption patterns at the whole-home level while the partner controls the appliances to match that pattern, would produce a viable comprehensive solution.

From an overall business opportunity perspective, our critical risks include:

(1) <u>High CAC</u>: We may find that the cost of customer acquisition is too high. To mitigate this risk, we will monitor the balance between the expected customer lifetime value and the CAC closely and adjust our business model accordingly. We currently expect that the Rate Management service yields a revenue LTV of about $120 over 5 years per customer, or equivalently over a shorter period if we are able to up-sell them to additional services. Thus, a CAC of $20-40 seems appropriate and reasonable for our target customer population.

(2) <u>Brand Competition</u>: While we believe that our technology gives us a distinct advantage, it will only play a role if we have access to consumer mindshare. While Nest and Opower, for example, are not exactly household brand names, they wield significant marketing heft and can block out our message if they emerge as competitors and get to potential customers first. To mitigate this, we have to develop our product quickly and position ourselves as a viable independent player, develop one or more marketing partnerships that open up a large distribution channel, or consider a strategic acquisition by a potential competitor to marry our technology with their distribution channel.

(3) <u>Supplier Intervention</u>: Since we do not partner with the competitive suppliers and are instead unbiased consumer advocates, they may view us as a threat. To mitigate this, we need to make sure that suppliers understand that we are not adversarial to them and in fact, if they can assume that services like ours are making efficient decisions on behalf of customers, they need not offer some of the steep discounts they offer today to capture consumers' attention.

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