SRM
INSTITUTE OF SCIENCE & TECHNOLOGY
Deemed to be **University** *u/s 3 of UGC Act, 1956*

18DCO301J - DATA X – APPLIED DATA SCIENCE WITH VENTURE APPLICATION

S.P.A.R.K

Submitted by
Abhijeet Kumar Jha – RA2011003010549

Team Members

Register Number	Name
RA2011003010499	Afraz Tanvir
RA2011003010549	Abhijeet Kumar Jha

TABLE OF CONTENTS

1. Introduction

S.P.A.R.K aims to optimize and distribute the load on the GRID. The peak hour load can lead to power cuts, blackouts, infrastructure failure and reduced lifespan of components causing the government and the electrical companies' huge losses. S.P.A.R.K aims to use modern AI/ML algorithms to understand user behavior pattern and foretell the load in advance to optimize it.

1.1 Need of the Project

Peak hour load on the power grid is huge problem. It causes sudden power cuts/ long power cuts. If multiple buildings were to use all of their powered devices at one time, but there was not enough electricity available in the grid to meet this demand, the power from the grid could be overdrawn, which, in turn, would lead to disastrous brownouts, blackouts, and other unexpected outages.
These peak events usually occur during sustained heat waves that during which the total system reaches maximum demand.
Times of peak demand put a great deal of strain on the grid, its infrastructure, and the generators so

curtailing actually relieves some of that stress and allows operations to run more smoothly. Hence, S.P.A.R.K is the need of the hour.

1.2 Approach

Our system places emphasis on the heating and cooling system of the home as they are the biggest energy consumers in an individual household. The system tracks user locally and recognizes their behavior pattern to intelligently heat/cool the house.

1.3 Benefit

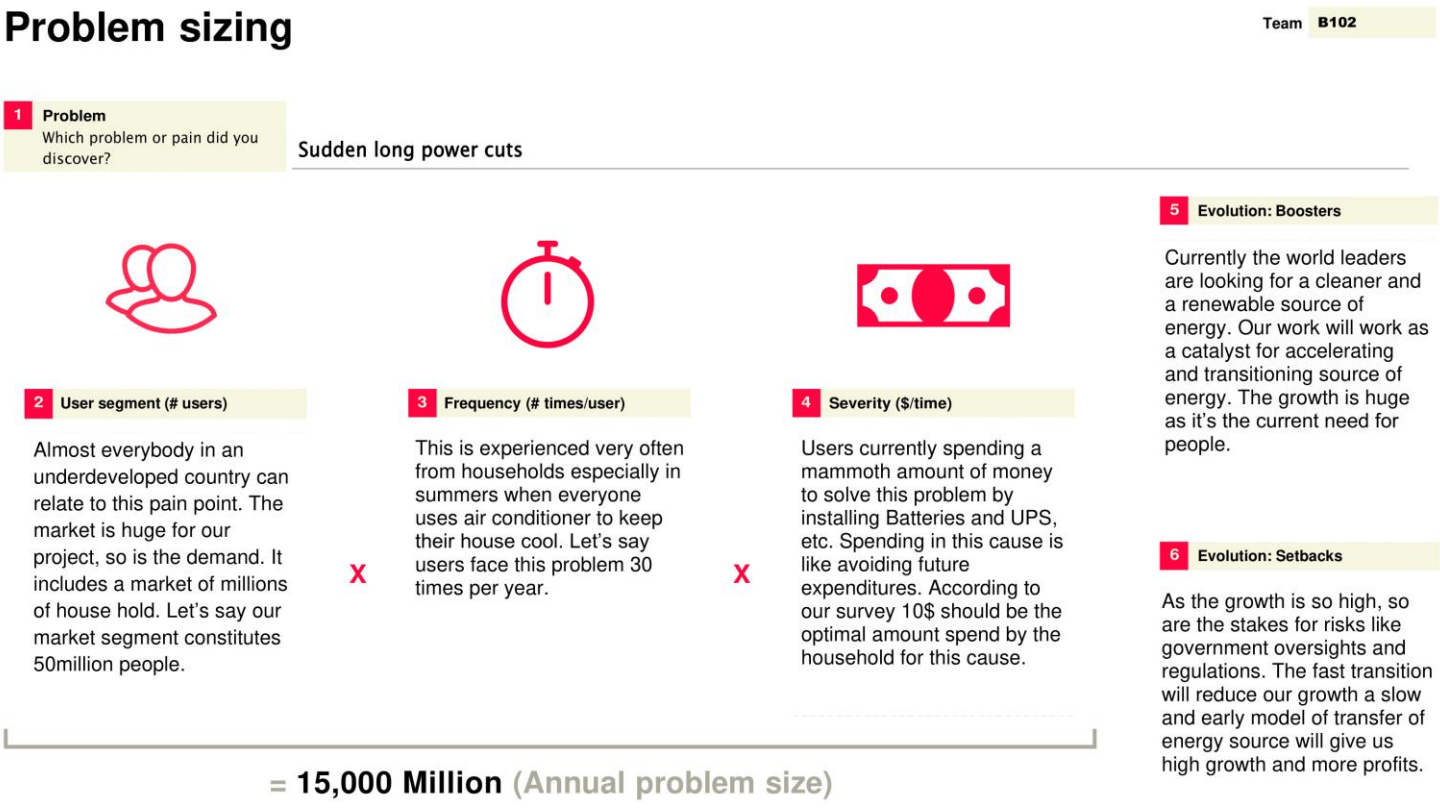
The system takes advantage of the inherent ability of the house to remain cooled/heated for some time even after the cooling/heating systems are turned off to distribute the load and avoid peak load on the GRID system. This allows the GRID to remain operational without power cut-offs.

1.4 Competition

Although similar projects are in research, currently there are no products available to masses commercially. Our solution is first of its kind.

Existing solutions can predict the grid usage but didn't know how to balance grid load.
S.P.A.R.K focuses to load the balance on grid, currently no product is doing this. Hence, we can say that we have a unique solution.

2. Customer Validation



Problem sizing

Team B102

1 Problem
Which problem or pain did you discover?

Sudden long power cuts

2 User segment (# users)

Almost everybody in an underdeveloped country can relate to this pain point. The market is huge for our project, so is the demand. It includes a market of millions of house hold. Let's say our market segment constitutes 50million people.

X

3 Frequency (# times/user)

This is experienced very often from households especially in summers when everyone uses air conditioner to keep their house cool. Let's say users face this problem 30 times per year.

X

4 Severity ($/time)

Users currently spending a mammoth amount of money to solve this problem by installing Batteries and UPS, etc. Spending in this cause is like avoiding future expenditures. According to our survey 10$ should be the optimal amount spend by the household for this cause.

= **15,000 Million** (Annual problem size)

5 Evolution: Boosters

Currently the world leaders are looking for a cleaner and a renewable source of energy. Our work will work as a catalyst for accelerating and transitioning source of energy. The growth is huge as it's the current need for people.

6 Evolution: Setbacks

As the growth is so high, so are the stakes for risks like government oversights and regulations. The fast transition will reduce our growth a slow and early model of transfer of energy source will give us high growth and more profits.

board of innovation

About this tool
The "Problem sizing" template is designed to help you make a quick guesstimate regarding the value of a specific user problem. No complicated excel spreadsheets that are tweaked until they show a billion dollar opportunity but a simple tool that forces you to agree on a couple of key assumptions.

Keep adjusting the template after you (in)validated those assumptions. If there is a validated problem size we can start thinking of solutions to solve these problems.

printsize: A3
boardofinnovation.com/tools

Persona

Team B102

GAURAV DUBEY

A student from Gurgaon, Haryana concerned about sudden power cuts in his area effecting his studies and daily life.

1 Pains
Fears, frustration and anxieties

Accidental power cuts

Long power cuts

Power cuts at crucial time

2 Gains
Wants, needs, hopes and dreams

Wants a system with less power cuts. Needs power 24X7 in his area. No hindrance in his studies due to power cuts.

3 Jobs to be done
What are they trying to do and why is it important for them?

They maintain reserve electricity and rely on batteries, generator, etc. So that when the time comes, they can use it for their survival.

4 Reality
How do they achieve those goals today? Any barriers in their way?

They use their reserve power when the time comes, but sometimes due to economic and technical reasons they failed to do so.

5 Stories and observations
Write down quotes or observations that best describe their experience

In today's contemporary world electricity is not a pleasure but a necessity. Sudden power cuts create a frustrating and stressful situation for people. Electricity cuts before the day of exam create a huge problem for students and working professionals. The uneven distribution of power consumption of grid causes sudden power cuts at the time when everyone tries to relax and chill.

6 Context
Are there other factors that we should take in consideration?

We should take care of the priority areas while distributing the power load. Like for example a hospital should have enough electric supply 24x7, so we have to give that area full electric supply at all times. Emergency reserve should also be maintained for emergency conditions.

Persona

Team B102

SHASHANK SINGH

A Gen-Z Student from Chennai who cares about the environment and where his power comes from.

1 Pains
Fears, frustration and anxieties

Electricity made using fossil fuels

Wastage of electricity

2 Gains
Wants, needs, hopes and dreams

Wants a system that can intelligently use more greener electricity compared to non-green alternatives. Wants to minimize wastage of electricity.

3 Jobs to be done
What are they trying to do and why is it important for them?

He tries to use as much of solar-generated electricity as possible by storing it in batteries to be used later

4 Reality
How do they achieve those goals today? Any barriers in their way?

Solar Power is highly dependent on the weather conditions so most of the times, it is not feasible to run off of solar power.

5 Stories and observations
Write down quotes or observations that best describe their experience

One of the most important fields of research today is renewable energy. In today's world where most the things in nature have already been destroyed by the humankind, it becomes incredibly important to become more conscious about our carbon footprint. Using greener energy alternatives and trying to reduce the energy consumption are few steps that can be taken on an individual level.

6 Context
Are there other factors that we should take in consideration?

We should try to shift most of our load to when greener sources are used to generate electricity. This way we can reduce our carbon footprint. Also, using natural heating and cooling capacity of the home to our advantage can help us minimize our energy consumption. Adding human behavior recognition, we can automate this process to make it seamless.

Problem Validation

1 Main goal: understand the context of a user & look for 'pains'

How often you experience power cuts in your area and household?

When! Ask when I don't experience it. Every night it's the same story come home to relax and then power cut occurs till midnight. Its so annoying and frustrating.

What are the reasons you think responsible for this sudden power cuts?

Well according to me, the excess usage of air conditioner by every house holds at a single time puts peak load on the grid that's why they have to cut the supply and hence we experience power cuts.

How do you tackle these problems?

I have batteries and generator which I use as a reserve for emergency time.

How much do you spend on this?

Everything comes with a price. I spend almost 500$ on batteries and the maintenance cost is different burden.

How much you can afford to spend for the solution of these problems?

I can spend a good amount of money, i.e is around 600-900$ if some solution arrives. Believe me one time expenditure is worth rather than facing this frustrating problem.

2 General tips

- Don't interrupt people too soon. If you are silent, people might feel uncomfortable so they will tell you more to avoid silence.
- Don't ask them to invent the future (solution).
- Ask why, why, why,… to have a very detailed view on what actually happens.
- A question that can be answered with just yes/no is not enough. Ask for more info.
- Ask for references or specific numbers where possible. "It's easy to do." is not enough. "It takes 10 min & 6 steps to complete X." is already better.
- Look for evidence/proof of existing behaviour!

board of innovation

About this tool
The "Problem Validation: Example Questions" tools is designed to guide you through your first problem validation interviews. Use these example questions to design your interview scripts. Truly understanding your target customers is key to the success of your venture, and it's hard to understand people without talking to them. **Tip:** Try to go in with an open mind, enjoy the conversation, and focus on really understanding *Why*.

printsize: A4
boardofinnovation.com/tools

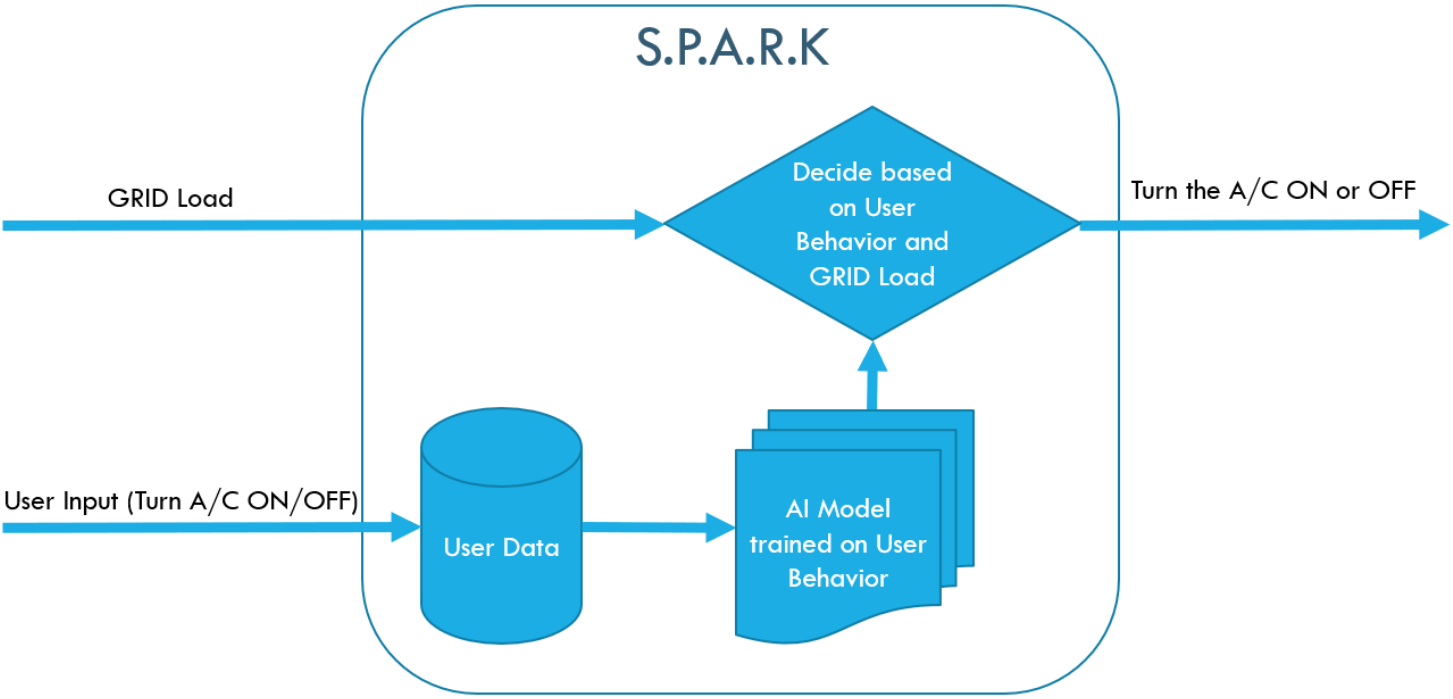
3. Project Description

We will observe user behavior and make a pattern of their electric usage activities and use the precool and preheat of the home to escalate our solution.

We will turn ON the air conditioner before the arrival of the user to their home, to uniformly distribute the load on the grid. It will also help in saving the electricity of the household.

We will make pattern of user coming back to come and then use precool feature to cool the home so that's user doesn't make electric demand during peak time.

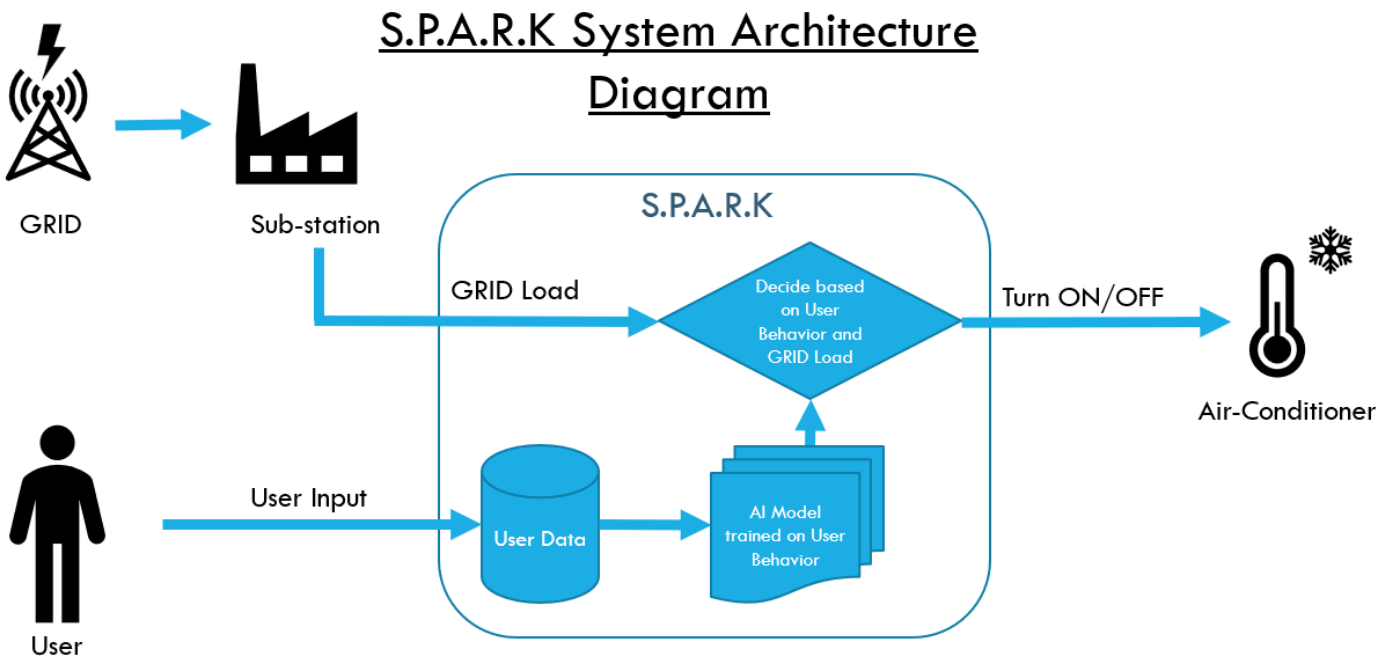
3.1 Illustrate the UI/ Input, output



3.2 Technical Components of the project

S.P.A.R.K collects user data locally on the system and uses it to identify behavior patterns. The usage behavior patterns found in the user data will be matched against average GRID load patterns to train an AI model.
The AI model can then be used to predict when to turn on/off the heating and cooling systems in the house to optimize and distribute the load on the GRID.
The system can be calibrated to better suit a house by measuring how the temperature increases/decreases throughout the day to get an estimate on the heat/cooling retention capacity of the house.
As more user data gets collected, the system learns more about the user and gets smarter about the predictions.

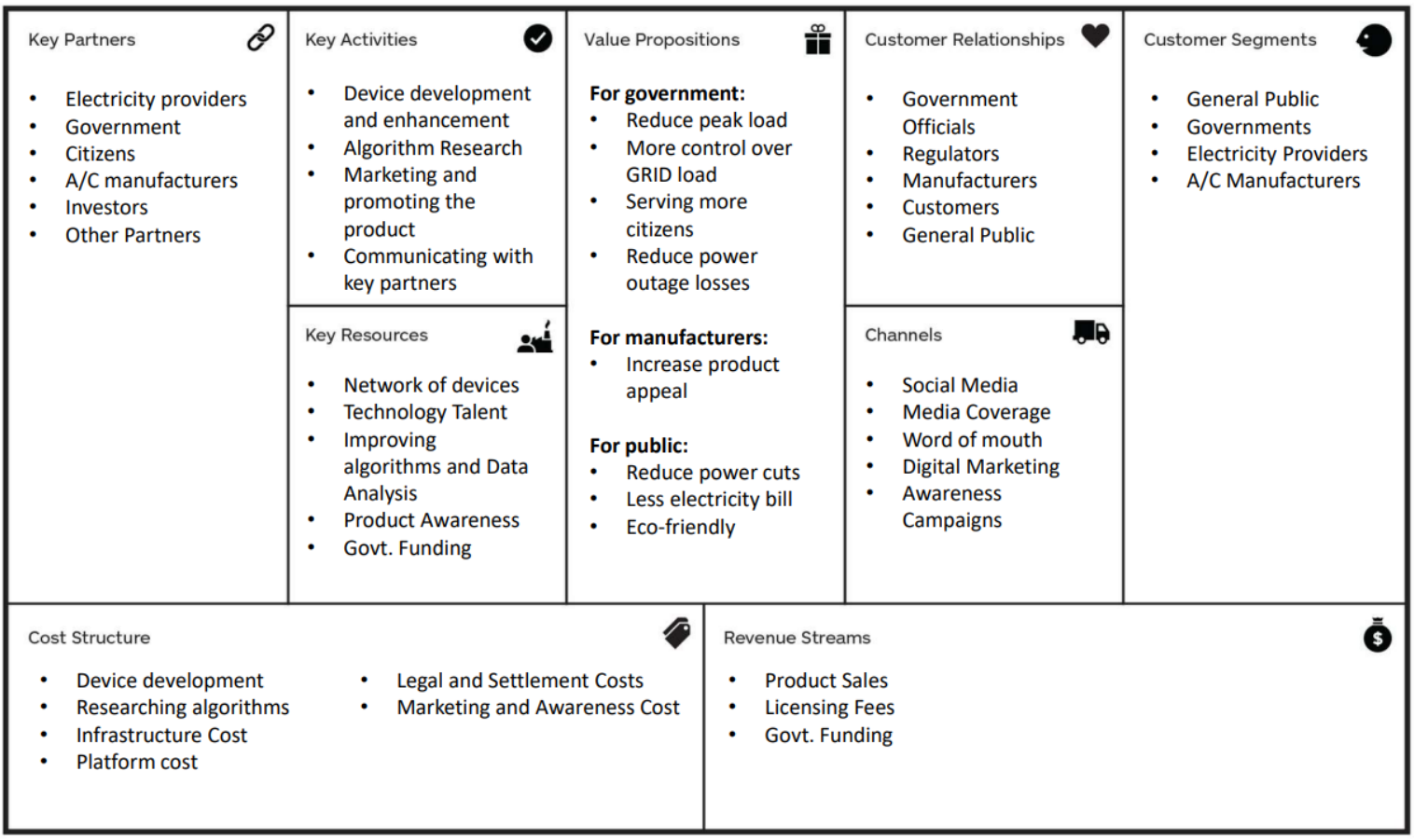
3.3 System Architecture



3.4 Data Flow in the system

S.P.A.R.K collects user data store it locally on the system in the User database.
The GRID load is retrieved from the local substation periodically.
The user database is then passed through ML algorithm to identify and train an AI model.
The AI model is then used to predict user actions and matched against the GRID data to determine when to turn ON/OFF the air-conditioner unit in order to optimize and distribute the load on the GRID.

4. Business Plan



4.1 Key activities

- We will develop and improve the hardware device that S.P.A.R.K will operate on
- We will research and optimize the algorithms used to decide when and when not to turn ON the air-conditioner

- We will market and spread awareness about S.P.A.R.K focusing on the benefits to the user and the environment
- We will communicate with key partners like the A/C manufacturers and the governments to give out licenses to use/integrate S.P.A.R.K into their products.

4.2 Key Resources

- The S.P.A.R.K devices as well as products from our partners with S.P.A.R.K integrated form a network to better optimize GRID load.
- The smartest minds of India will work to optimize and improve S.P.A.R.K
- Analyzing the data from S.P.A.R.K devices and partner products with S.P.A.R.K technology to improve existing algorithms.
- Raising awareness about S.P.A.R.K and it’s benefits to general public to gather momentum
- Funding from Governments to further develop and improve S.P.A.R.K

4.3 Key Partners

- Electricity providers: They will benefit from having more consistent demand.
- Government: They will benefit from reduced infrastructure costs.
- Citizens: They will benefit from reduced power cuts and electricity bills
- A/C manufacturers: They can increase appeal of their products to the consumers.
- Investors
- Other Partners

4.4 Value Propositions

<u>For government:</u>

- Reduce peak load
- More control over GRID load
- Serving more citizens
- Reduce power outage losses

<u>For manufacturers:</u>

- Increase product appeal

For public:

- Reduce power cuts
- Less electricity bill
- Eco-friendly

4.5 Cost Structure

- Cost to further develop and improve device
- R&D costs for better algorithms
- Building out Offices, Factories and R&D labs
- Running and Maintaining S.P.A.R.K platform
- Legal and Settlement Costs
- Marketing and Awareness Costs

4.6 Revenue Streams

- Revenue generated from selling S.P.A.R.K devices
- Licensing out S.P.A.R.K technologies to the partners to integrate into their own products
- Receiving funds from governments to implement and maintain S.P.A.R.K platform

4.7 Customer Segment

- General Public who would buy S.P.A.R.K devices
- Governments who would integrate S.P.A.R.K technology into their GRID
- Electricity Providers who use S.P.A.R.K data and analytics to better deal with demand
- A/C Manufacturers who would license S.P.A.R.K technology to integrate in their products

4.8 Customer Relationship

- With Government Officials to integrate with GRID
- With Regulators to deal with legalities and settlements
- With Manufacturers to license S.P.A.R.K for their products
- With Customers to better address their needs
- With General Public to spread awareness about benefits of S.P.A.R.K

4.9 Channels

- Promoting on social media like Twitter and Instagram
- Media Coverage on conventional mediums like newspapers and television
- Word of mouth from our customers
- Digital Marketing in form of ads on various platforms
- Organizing and funding awareness campaigns to make general public aware of benefits of S.P.A.R.K

5. Financial Plan

5.1 Growth Strategy

- By End November we will be able to make a prototype for our solution.
- Then by mid-January we will be able to make a full product.
- Then during the same time, we will contact our investors to invest in our startup.
- After getting the investors we will try to scale up and probably gather more real-world data.

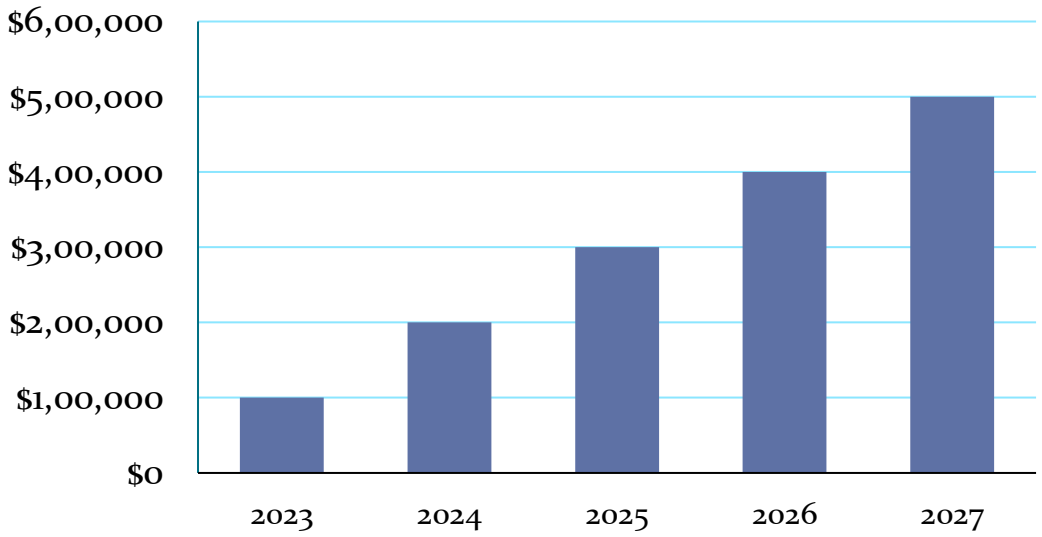
- If all gets good, that’s the plan we will be able to convert our solution to a venture/startup.
- Once we form the startup, preferably in 2023, we will start marketing and bring S.P.A.R.K to general public’s attention
- Once we gather enough real-world data and gain support from general public, we will approach the govt. to pitch our startup and get funding
- With government and VC funding we will rapidly expand the number of offices and employees under our start-up
- Once we gather enough talent, we will establish and R&D facility to further improve S.P.A.R.K
- Once the S.P.A.R.K reaches a stable, risk-free stage, we will start contacting other governments around the world to further promote S.P.A.R.K

5.2 Traction

Key Metrics (Projected)

	Clients	Orders	Gross Revenue	Net Revenue
2023	100	1100	$100,000	$70,000
2024	200	2000	$200,000	$160,000
2025	300	3000	$300,000	$250,000
2026	400	4000	$400,000	$300,000
2027	500	5000	$500,000	$400,000

Revenue by Year (Projected)



5.3 Financials

	2023	2024	2025	
Users	50,000	400,000	1,600,000	
Jobs	500,000	4,000,000	16,000,000	
Average price per job	75	80	90	
COMPANY REVENUE @15%	5,625,000	48,000,000	216,000,000	
- Cost of Revenue	0	0	0	
Gross Profit	5,625,000	48,000,000	216,000,000	
OPEX				
- Sales & Marketing	5,062,500	38,400,000	151,200,000	70%
- Customer Service	1,687,500	9,600,000	21,600,000	10%
- Product Development	562,500	2,400,000	10,800,000	5%
- Misc.	281,250	2,400,000	4,320,000	2%
TOTAL OPEX	7,596,750	52,800,000	187,920,000	
EBIT	-1,968,750	-4,800,000	28,080,000	13%

6. Conclusion

Hence, the all the details and technicalities of S.P.A.R.K project was explained successfully.
In future we will optimize the product, improve the pattern making ability and will scale out the product to the masses.