Power Plant Energy Predictions – Video Script.

Hey Team! Here are some guides for our video to aim at the professional look and feel I think we want to deliver – I’m open to your suggestions as well.

Try recording this with your cell phones in a horizontal orientation, in selfie mode at about 3 to 4 feet away from you. Make sure your face and upper part of your body shows in the frame. Try to choose a quiet location and I suggest you sit down to prevent too much uncontrolled motion in the video recording (although I was wondering if we should try walking with our phones in selfie mode when applicable).

I envision the final video as a short documentary to present our research and results, so while we can smile, picture ourselves presenting to an audience of investors that we’re trying to convince to support our research because it is both profitable and impressive. Think of the attitude of someone presenting in a TED talk as well.

I think for our dress code we should aim for a dress shirt, ideally no hats or t-shirts. I plan to use only the audio in some parts as a voice-over, but I think we should visually include ourselves talking in the video too.

Let me know if you have any questions or suggestions.

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| Person | Script | Approx.  Duration (seconds) |
|  | TITLE CARD: USD - MS AAI | 10 |
| Israel | We live in the era of information, the time when everyone is connected to the Internet 24/7, in our cell phones, in our computers. | 10 |
|  | TITLE CARD: AAI-500- Probability and Statistics for Artificial Intelligence. | 10 |
| Darin | It’s easy sometimes to take it for granted, we’re used to it. It’s sometimes hard to realize these things are there: a refrigerator or a microwave in our kitchen, our LED television, the light in our house, everything is just there for us, all the time. | 16 |
|  | TITLE CARD: Professor Dallin Munger, M.S. | 10 |
| Mani | We don’t even see it anymore. We only notice that it’s there when it’s gone: A power outage and then you notice, because NOTHING seems to work without it. | 11 |
| Israel | We’re obviously talking about electrical power. Without it, no battery charging for your cell phone. The food in the refrigerator will go bad, and the A/C wouldn’t run. | 12 |
| Darin | Electric power is everything. I cannot think of an industry that could live without it today. Without it, the whole economy of the world would collapse. | 8 |
| Mani | Producing electricity is one of the most important tasks in the world. There are many kinds of Power Plants, but today we’re going to talk about Combined Cycle Power Plants. Have you heard about them? | 10 |
| Israel | Combined Cycle Power Plants, or CCPP for short, are more efficient because they combine multiple methods.  In the first Stage of the plant they burn fuel and make a turbine spin to induce electricity. That produces a lot of heat. | 17 |
| Darin | Typical fuel plants let that heat escape, but CCPP use that residual heat as the source input for Stage Two: they boil water and use the steam to make a second turbine spin, inducing even more electricity, releasing water vapor into the atmosphere. | 18 |
| Mani | It's a masterpiece of engineering in our time capable of delivering typically from 100 up to 1000 Megawatts per hour depending on the number of combustion turbines, steam turbines, and other optimized heat recovery systems. | 15 |
| Israel | CCPP’s are also impacted by weather factors, such as ambient temperature, atmospheric pressure, and relative humidity. These factors have a direct influence on the energy output of the power plants, which affects their efficiency and ultimately translates in economic gains or losses for the investors of the plant, and ultimately to the final user: all of us. | 25 |
| Darin | Can you imagine if we could know in advance the energy output of these power plants based on the atmospheric conditions?  What if we could input the information on the weather forecast to accurately predict the efficiency of the CCPP? | 17 |
|  | TITLE CARD: MS AAI - Team 2 Presents… | 5 |
| Mani | Imagine the impact of such forecast to the demand; the general public as well as companies could prepare in advance for their energy needs and make decisions to effectively plan their upcoming energy bill. I’m Manikandan Perumal. | 15 |
|  |  |  |
| Israel | I’m Israel Romero | 2 |
| Darin | I’m Darin Verduzco, and together we’ll show you a model we built to effectively predict the output of a Combined Cycle Power Plant with more than 95% accuracy. | 12 |
|  | TITLE CARD: POWER PLANT ENERGY PREDICTOR. | 10 |
| Israel | The first task is always to understand the data available. We observed data collected in a CCPP for over 6 years (from 2006 to 2011) and identified the variables being captured:  Ambient temperature, Atmospheric Pressure, Relative Humidity, and Exhaust Vacuum (a very particular measurement that represents the pressure condition at the exhaust of a steam turbine, which can sometimes be lower than the atmospheric pressure). | 26 |
| Mani | All these variables have been identified to affect the energy output of the plant, so the engineers have placed hundreds of sensors throughout key locations within the facility. We took those variables and analyzed their correlations, meaning how each one affects the output value. We found some interesting results. | 20 |
| Darin | We found that Temperature appears to be the main driver for the efficiency output, but it has an inverse correlation, meaning the higher the temperature gets, the lower the energy output the plant can produce. | 12 |
| Israel | The rest of the variables have a lower but not insignificant effect on the power output. We noticed that the accuracy of predictions increased a few extra percentage points when including all variables. Every point counts! | 12 |
| Mani | In our analysis, we tried with nine models, but in this presentation, we will focus only in the TWO best predictive models we found: Linear Regression and Random Forest Regressor. | 12 |
| Darin | With linear regression we were able to predict the energy output with a precision of up to 93%. It is a very simple and reliable model that can be implemented without extensive computational resources, therefore no need for expensive hardware to perform the predictions. | 15 |
| Israel | With the Random Forest Regressor model our prediction goes up to 96%. While every point counts, it’s important to notice that Random Forest Regressor models DO require extensive computational resources, so it may only be worth to have a larger investment for plants in extreme weather conditions. | 18 |
|  | TITLE CARD: Potential Applications | 5 |
| Darin | To begin with, the Power Plant itself can benefit from this model by simply adjusting plant operations in real-time based on the input from the sensors, optimizing parameters like fuel usage, turbine loads, and cooling system operations to maximize efficiency output. | 16 |
| Israel | Another possible application is Energy Demand Forecasting. With accurate power output predictions, energy companies can better balance energy supply and demand, planning a better distribution, minimizing overproduction or shortfalls, and ensuring reliable energy availability. | 17 |
| Mani | Preventive Maintenance Scheduling would be possible with this model. The plant can detect potential operational stresses or inefficiencies, indicating the potential need for maintenance, extending the operational life of the equipment and preventing outages. | 14 |
| Darin | For all of us users of the electrical network, predicting the power output may allow us to have better financial planning as well as better control the demand on peak hours when the forecast predicts higher pricing. | 12 |
| Israel | Another potential use is Carbon Emission management. By keeping the plant running in optimal condition, it can reduce its carbon footprint while keeping a stable energy supply. | 10 |
| Mani | How about energy trading? If you are forecasting an excess or a deficit of energy, the exchange of electricity between different plants could be performed more efficiently. | 10 |
| Darin | The predictor can also complement renewable energy sources like solar or wind. When those renewables become intermittent, CCPPs with accurate predictions can effectively fill in the gaps. | 12 |
|  | TITLE CARD: Why should you invest in this project? | 5 |
| Israel | Since 1882 when Edison established the first public power plant in Lower Manhattan, New York City, it has become part of our daily lives, and clearly electric power is not going anywhere. In the era of Information, artificial intelligence and predictive models like ours are already providing meaningful insights to several industries, including the Energy Industry. | 22 |
| Mani | Artificial Intelligence is becoming the driver of the economy, and it’s a proven fact in history that the pioneers and visionaries who invest first tend to not only get a higher profit reward but get to make the rules of the game! | 15 |
| Darin | While all information about the future has an error, 93% to 96% accuracy is certainly a great level of confidence that will provide a reliable source of information for all the practical applications of this project, and therefore, showing a clear path to profitability and return on investment. | 18 |
| Israel | Investing in our project means investing in more research to build similar models that can benefit other industries, and that you can also become a part of! The sky is the limit! The possibilities are endless! | 14 |
|  | TITLE CARD: POWER PLANT ENERGY PREDICTOR. | 5 |
|  | CREDITS | 20 |

Total Time: **8 min 49 sec**.