Solar PV App

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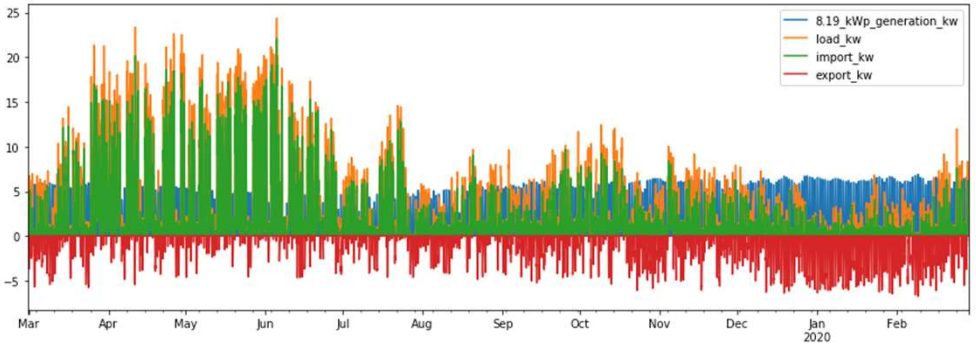

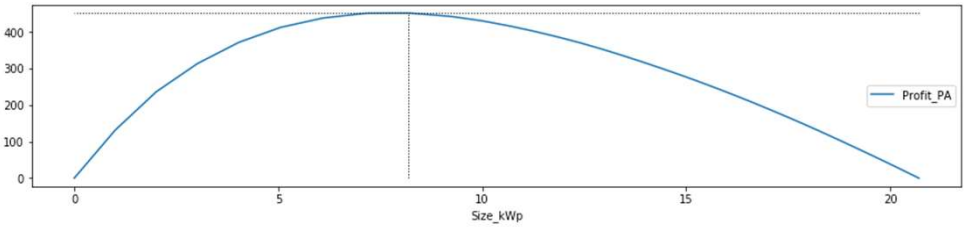

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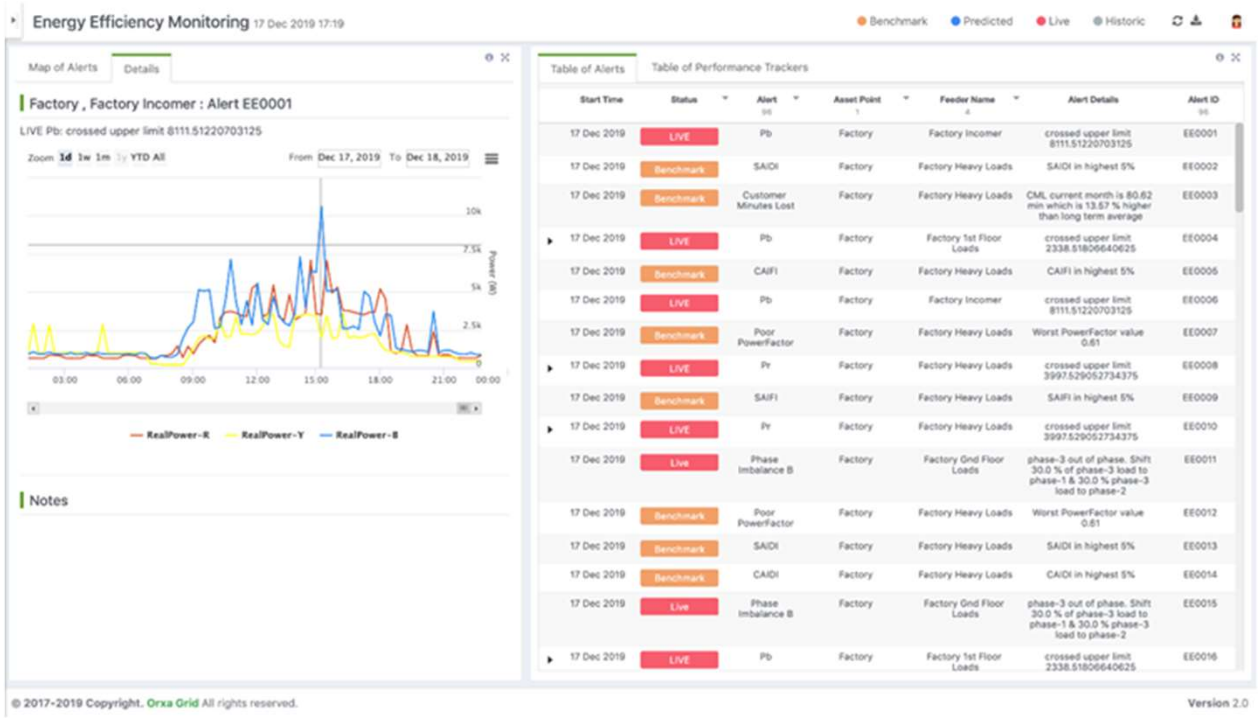
OrxaGrid develops IoT devices, analytics and web dashboards for power grid customers

Our app portfolio includes SaaS solutions for energy efficiency, asset health and energy forecasting

A new suite of renewable energy apps are currently under development



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Solar PV Sizing Tool

- Decision support SaaS tool
- Optimizes the capacity (size) of a proposed Solar Photovoltaic installation to maximise financial benefit for building owner
- Considers:
  - Electricity demand profile of building over past year using industry standard Half Hourly energy meter data
  - Building roof size, pitch angle and compass direction
  - Grid reference of building
  - Local energy tariffs for import and export
  - Historic meteorological data for building location
- Produces report for building owner complete with financial forecasts and energy visualisations

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Background on Solar PV

- Solar Photovoltaic (Solar PV) is a renewable energy conversion technology which generates electricity from sunlight
- Size of Solar PV industry in 2018 was 52.5 billion USD
- Solar panels on rooftop absorb photons and produce direct current electrical energy
- Solar inverters convert direct current to alternating current for use in building or for export to power grid
- Solar PV installation system lifecycle is 25 years
- Installation reduces energy costs, reduces CO2 emissions and owner can earn energy export fees

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User Story for OrxaGrid Solar PV App

- I am a building owner or building energy manager
- My building has high costs of energy usage
- I would like to reduce our energy costs and/or our CO2 emissions
- The building has spare roof space available
- We have access to capital for installation costs
- We lack domain-specific expertise on Solar PV system sizing
- We would like an independent cost benefit analysis report before approaching Solar PV installers for quotations

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Value Proposition

- Free-to-use decision support tool (other similar software are paid-for solutions or try to upsell the installation product)
- Analyzes building energy demand and forecasted generation at a high temporal resolution (most solar installers do not offer this)
- Uses high spatial resolution resampled satellite weather data for accurate energy forecast
- Populates fields with useful default values which can be relied upon for many buildings
- Quick and easy to use, with integrated embedded maps

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Benefits to OrxaGrid

- Gain experience in productionising our data science models directly to Azure cloud without involving our wider developer and operations team
- Lead generation of building owners interested in energy monitoring and analytics systems
- Increase brand awareness

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Implementation

- Deployed as Flask app on Azure
- User input data received from HTML form and validated in Python
- API call constructed from form input and file upload
- HTTP request sent to solar energy forecasting service
- Annual hourly energy generation forecast received from API
- Optimal system size calculated in Python
- Results table and visualizations served to browser

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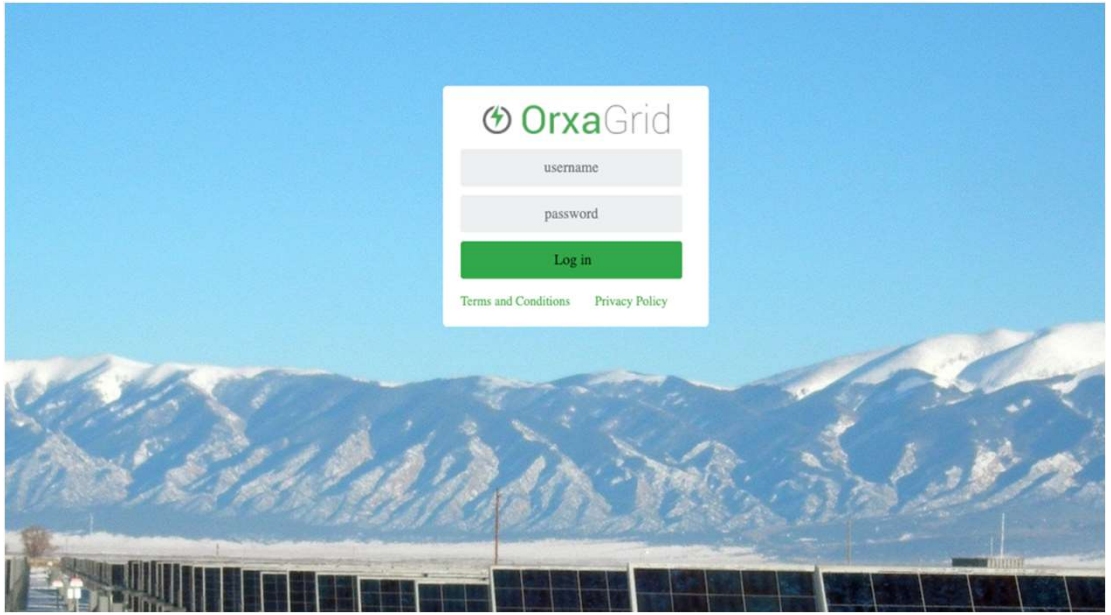
Login Page

- Single user login
- Credentials provided in Help page
- Links to T+C's, privacy policy and help page provided



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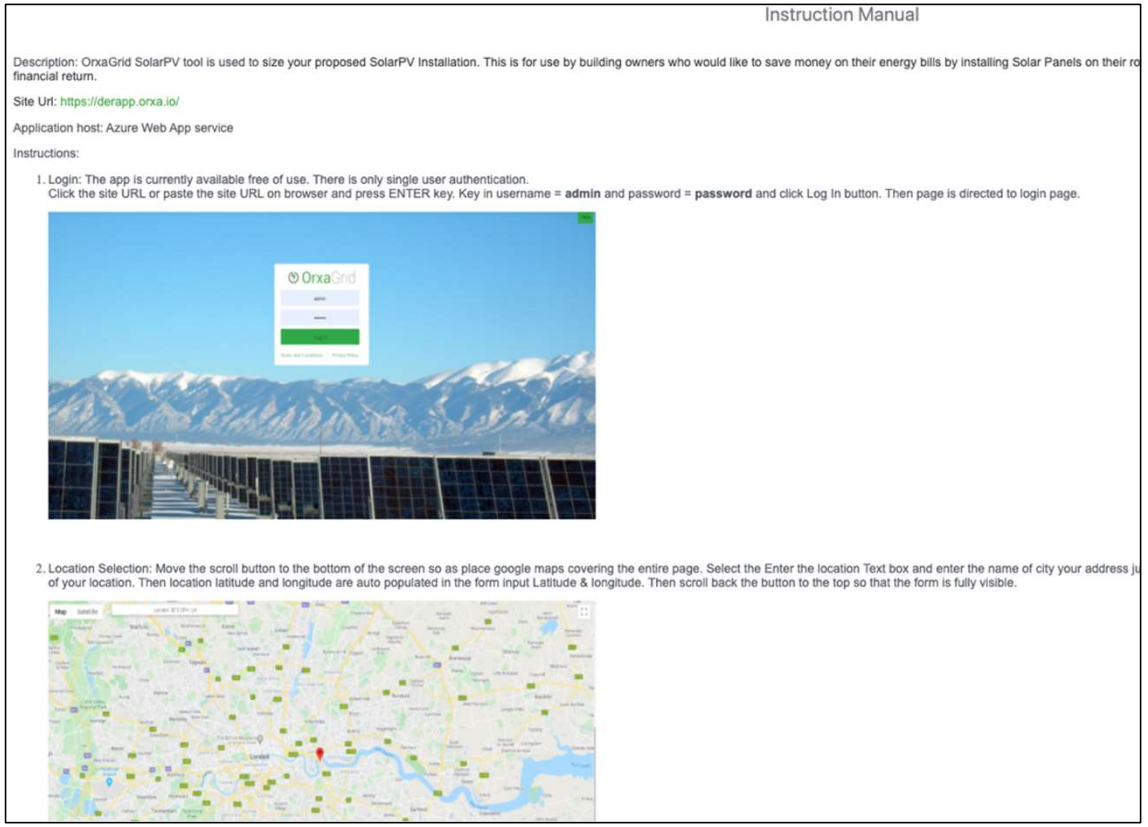
Help Page

- Instructions for using app
- Download link for sample Half Hourly energy data file
- Example results given



Instruction Manual

Description: OrxaGrid SolarPV tool is used to size your proposed SolarPV Installation. This is for use by building owners who would like to save money on their energy bills by installing Solar Panels on their ro financial return.

Site Url: https://derapp.orxa.io/

Application host: Azure Web App service

Instructions:

1. Login: The app is currently available free of use. There is only single user authentication.
   Click the site URL or paste the site URL on browser and press ENTER key. Key in username = **admin** and password = **password** and click Log In button. Then page is directed to login page.

2. Location Selection: Move the scroll button to the bottom of the screen so as place google maps covering the entire page. Select the Enter the location Text box and enter the name of city your address ju of your location. Then location latitude and longitude are auto populated in the form input Latitude & longitude. Then scroll back the button to the top so that the form is fully visible.

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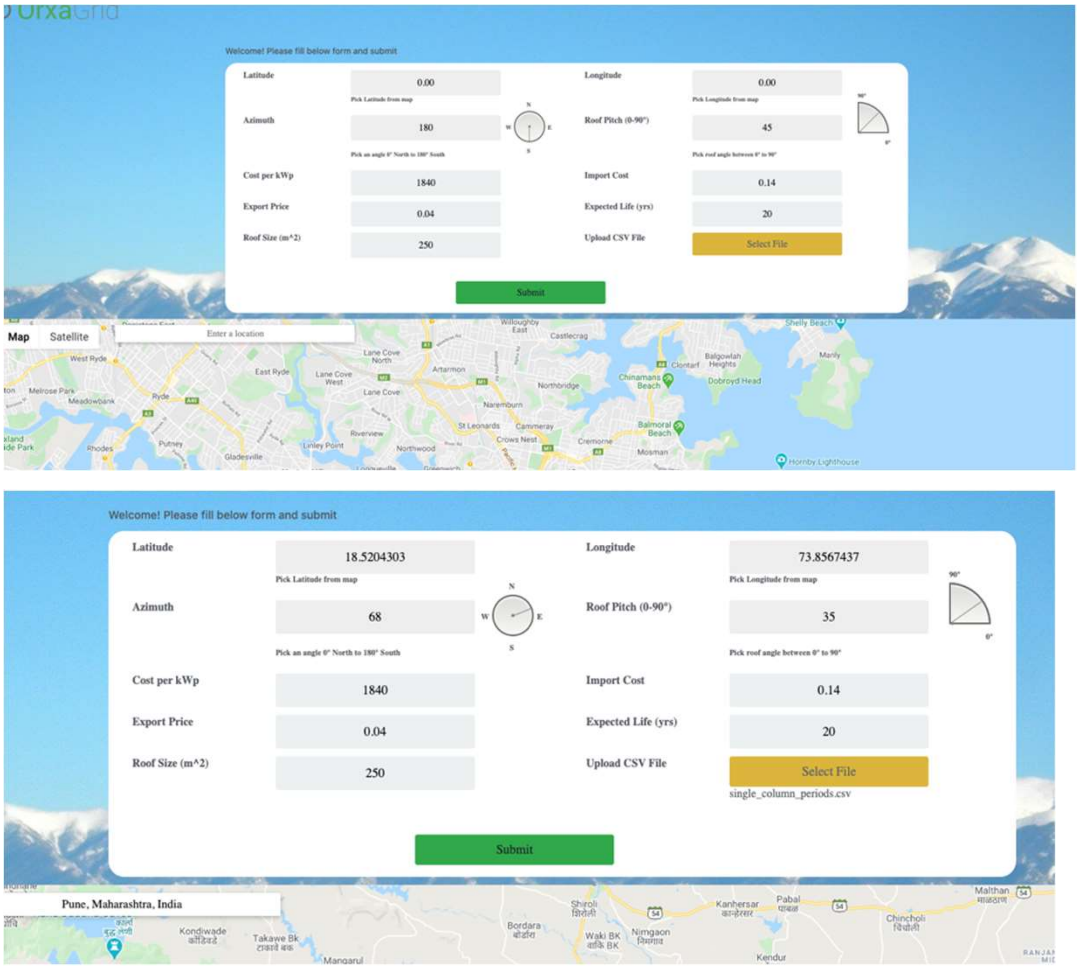
Data Entry Page



- User provides details of their building
- Form is loaded with reasonable default values
- GUI widgets for selecting azimuth (compass direction of roof) and pitch (roof tilt angle)
- Embedded map auto-fills latitude and longitude according to user selected location

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File Upload

- User selects a Half Hourly Meter Data file to upload
- Industry standard data which itemises the electrical energy used by a building for each half hour of the past year

	A	B	C	D	E	F	G	H	I	J	K	L
1	Meter No:	367238678										
2	Units:	kWh										
3	Date	Total	00:00	00:30	01:00	01:30	02:00	02:30	03:00	03:30	04:00	
4	01-Jan-18	115.9	1.7	0.9	0.2	0.2	1.9	0.2	0.3	1.9	0.2	
5	02-Jan-18	115.5	1.5	1.4	2.5	1.3	1.4	1.4	1.3	1.8	1.3	
6	03-Jan-18	13.1	0.1	0.6	1.1	1	0.1	0.1	0.1	0.1	0.1	
7	04-Jan-18	105.3	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.1	0.1	
8	05-Jan-18	112.1	0.4	0.4	0.3	1.8	0.9	0.4	1.4	0.3	0.8	
9	06-Jan-18	92.2	0.2	0.3	0.8	0.2	0.4	0.2	1.7	0.3	0.3	
10	07-Jan-18	111.2	0.4	0.4	0.3	0.9	0.4	0.3	1.9	0.3	0.9	
11	08-Jan-18	81.6	1.2	0.2	1.3	0.3	0.2	0.2	1.6	0.3	0.1	
12	09-Jan-18	24.8	0.2	0.2	0.7	0.7	0.2	0.2	1.2	0.2	0.2	
13	10-Jan-18	33	0.7	0.2	0.2	0.7	0.7	0.2	0.2	0.2	0.2	
14	11-Jan-18	69.2	0.6	0.1	0.1	0.1	1	0.1	0.1	0.1	0.1	
15	12-Jan-18	152.2	0.6	0.1	0.6	0.1	0.6	0.1	0.1	0.6	0.6	
16	13-Jan-18	153.8	3	1.4	2.5	2	2.5	2	1.9	1.4	1.4	
17	14-Jan-18	145.2	0.6	0.2	0.1	0.8	1.6	0.2	0.1	0.2	0.2	
18	15-Jan-18	171.7	0.7	0.3	0.8	0.3	1.5	0.2	0.3	0.7	2.5	
19	16-Jan-18	198.4	0.4	0.9	0.3	0.9	0.3	0.9	0.3	0.4	1.3	
20	17-Jan-18	32.6	0.8	0.5	0.3	0.5	0.3	0.5	0.8	0.5	0.8	
21	18-Jan-18	205.5	0.8	0.9	0.4	0.4	0.9	0.3	0.9	0.3	0.9	
22	19-Jan-18	224.2	1.4	0.7	0.3	1.4	0.2	0.4	0.7	0.8	0.3	

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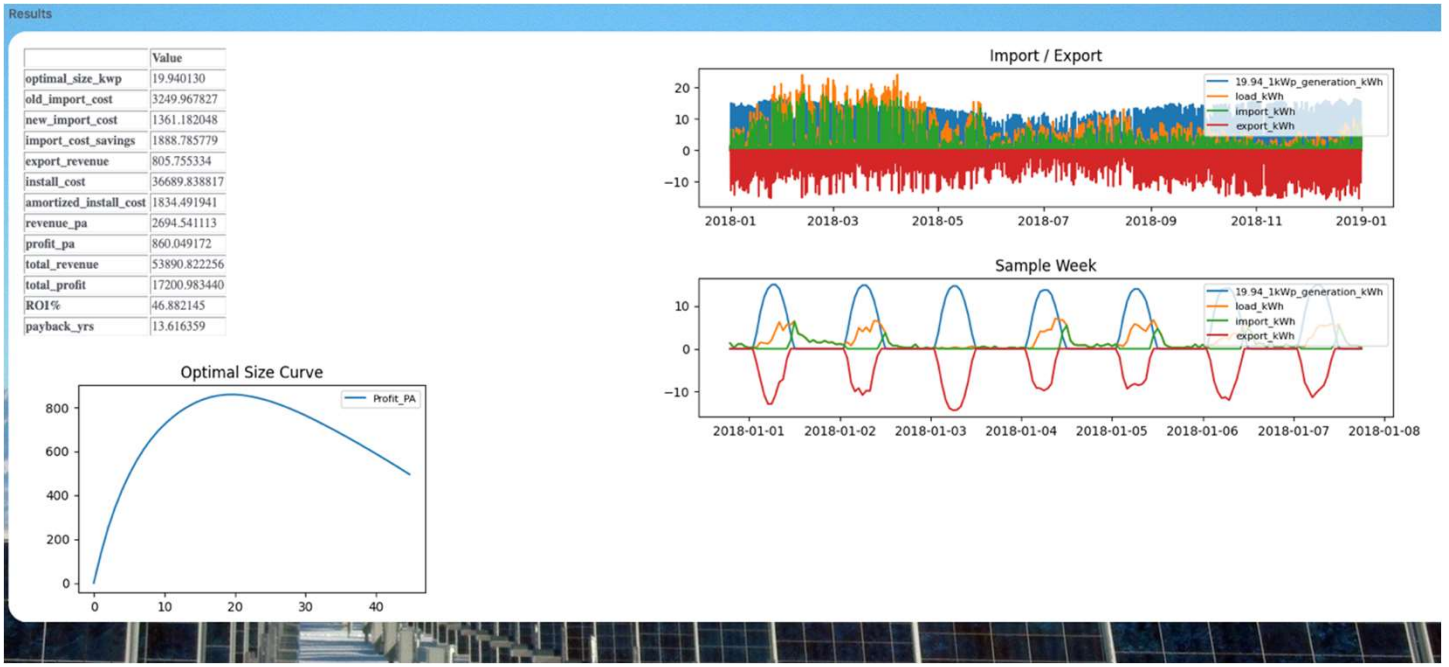
Results Page

- Table of financial returns
- Graphs of generated, imported and exported energy
- Optimal system size graph



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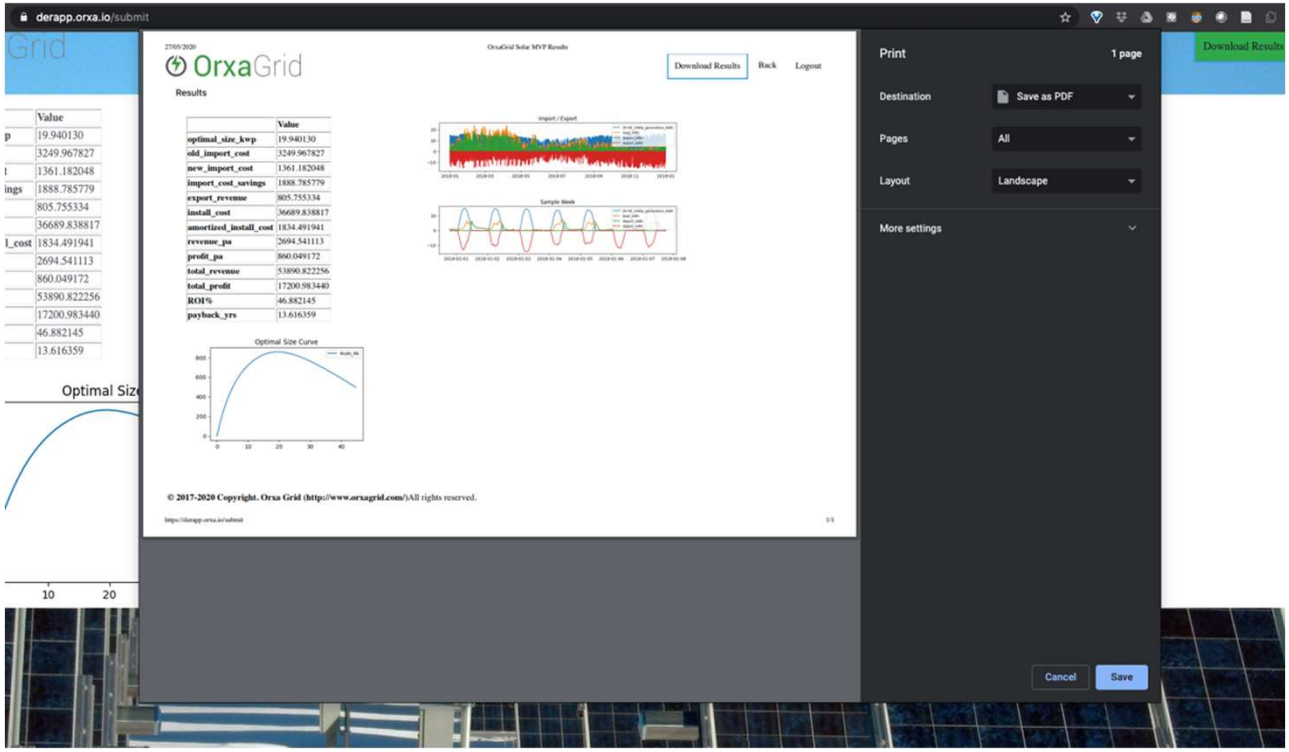
Interpretation of Results

- Report can be downloaded as pdf file
- User can now make an informed choice as to whether Solar PV installation would benefit their building
- Provides benchmark for cost benefit calculations provided by installers during quotation phase



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Development Team

- Sanjeev Kumar – Data Scientist
- Robert Brown – Power Systems Engineer
- Harish Iyer – Front End Developer

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