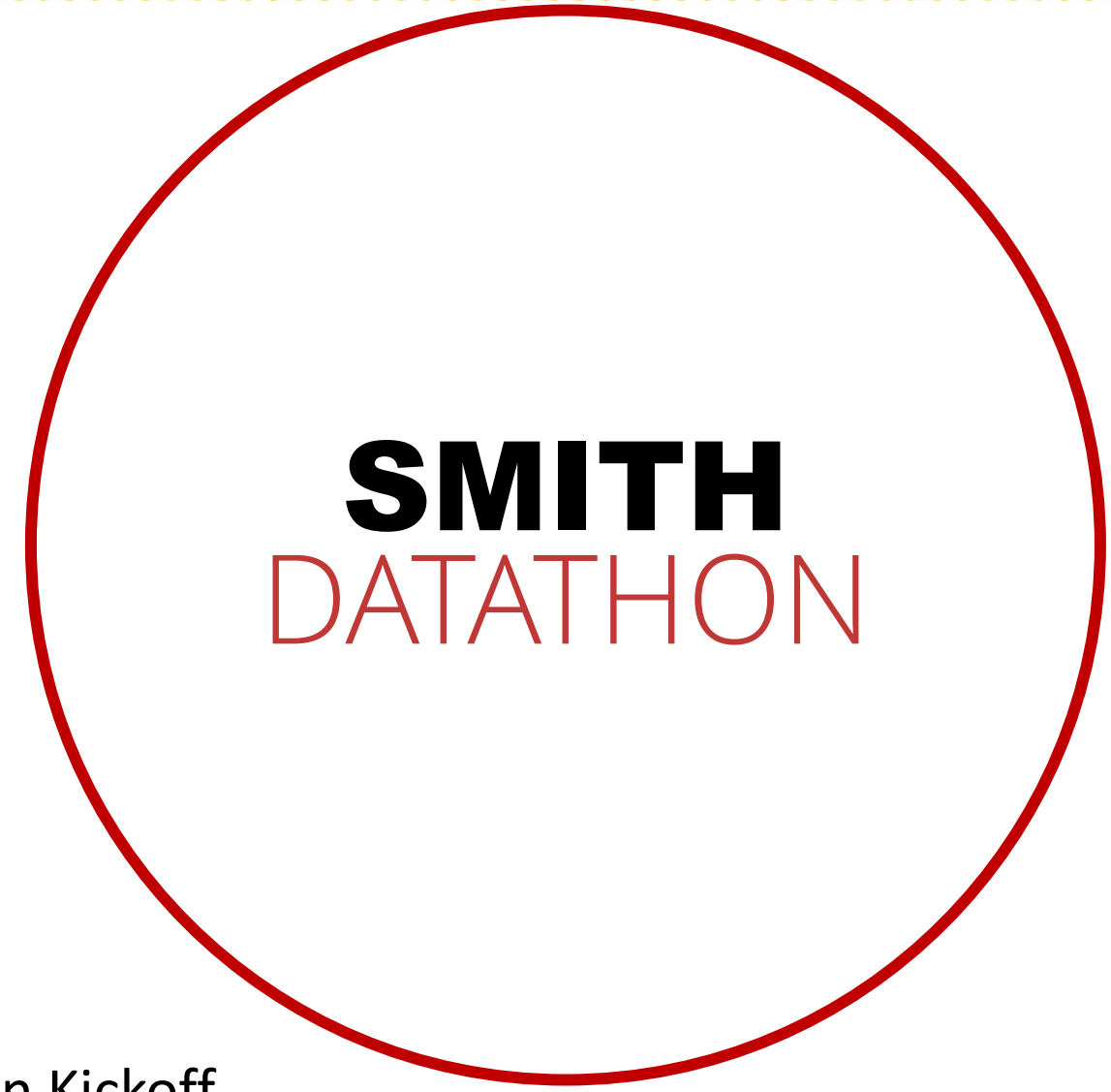


UMD SAC Smith Datathon Kickoff

April 19th, 2021

Agenda

Thank You

A special thanks to **Professor Moe** and **Professor Elmaghraby,** for letting Deloitte host the 2nd Annual Datathon as part of the Smith Analytics Consortium!

Deloitte.

Datathon | Robert H. Smith School of Business

Overview

Requirements

Team

4 – 5 students
(mixture of Undergrad / Graduate)

Timeline

Kick-off/Release Dataset:
4/19 (woohoo!)

Submission/Preliminary Judging: 4/28 @ 5:00PM

Final Presentations:
4/30 (10:00 AM – 1:00 PM)

*Timeline shown later

Technology

Data Visualization:
Tableau 2019.4 (or newer)
(let us know if you need access)

Data Analysis:
Google Colab
Open Source (R, Python, etc.)

Data

(2010 – 2020)

Photovoltaic (PV) Energy Generation (MD)

Submission

1. Packaged Tableau workbook (.twbx)
2. 5 -7 slide presentation
3. 7 min voice-over Presentation

The Smith Datathon enables students to team-up, showcase their data analytics skills, and sprint to the best solution. With the provided dataset, teams will have several days to model and visualize insights before final presentations and judging.

Presentations will be evaluated using several criteria, ranging from technical impact to creativity in approach.

Submission Criteria

A Single .Zip File Containing:

Packaged Data Visualization	File containing the visualization + the data i.e. packaged Tableau (.twbx)
PowerPoint / Keynote Presentation	5-7 slides to present your insights and solution (Introduction of Problem / Opportunity, Findings, Next Steps/Art of the Possible)
Zoom Video	Up to 7 Minute screenshare / audio recording

Teams must submit their **voice-over PowerPoint presentation** and **.ZIP file** to the **Datathon Google Drive** (sent from Professor Moe and Professor Elmaghraby) by **5 pm** on **4/28**.

Schedule

Kick-off | Office Hours | Deadline | Final Presentations + Judging

	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	**Apr 19** **Kickoff / Overview** Problem and dataset are shared. 6:15-7:15PM	**Apr 20**	**Apr 21**	**Apr 22**	**Apr 23**
		Teams work to analyze data, using Core Consulting Series skills, to deliver novel insight.			
Week 2	**Apr 26**	**Apr 27**	**Apr 28** **Solutions Due for Final Judging**** Teams submit presentation of analysis and results 5:00PM	**Apr 29**	**Apr 30** **Final Presentations** Finalist teams present, winner selected and prize awarded (Virtual) 10:00 AM – 1:00 PM
	Teams work to analyze data, using Core Consulting Series skills, to deliver novel insight.				

***Solutions will consist of each teams presentation (5-7 slides), summarizing their methods and results.**

Scoring Rubric

Importance of the Question: The team's solution identifies an impactful hypothesis and provides adequate support behind any assumptions.

1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Strongly Disagree — Neutral — Strongly Agree

Score _____

Novelty of the Insight: The solution has a impactful, actionable insight for the client.

1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Strongly Disagree — Neutral — Strongly Agree

_____

Quality of the Methodology: The team logically structures and defends their problem solving approach.

1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Strongly Disagree — Neutral — Strongly Agree

_____

Quality of Presentation: The team articulated their solution's business case to the judges at a client facing level.

1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 — 10

Strongly Disagree — Neutral — Strongly Agree

_____

Team Number

Grand Score Total

Case Background

Solar Photovoltaic (PV) Power Cells, which were discovered in 1839, have become a key driver towards cleanly producing energy. Despite its popularity, solar energy only accounted for 1.8% of the total U.S. electricity generation in 2019. Due to the increase in climate change awareness, the “Renewables” energy production sector has seen increasing interest from governments around the world.

Of the many benefits that producing, providing, and consuming solar energy already offer, the U.S. Government has also been offering incentives for companies to use solar powered energy and technology. The main Federal incentive is the Investment Tax Credit (ITC), which offers 26% in tax credits for PV systems commencing construction by 2022.

https://i1.wp.com/www.euroscientist.com/wp-content/uploads/2020/04/chelsea-WvusC5M-TM8-unsplash-scaled.jpg?fit=2560%2C1920&ssl=1

Case Overview

The Terps PV Corporation (TPVC) wishes to break into the state of Maryland PV market and take advantage of the ITC tax credit before 2022. The TPVC has hired your team to craft a compelling business case for developing a PV array in Maryland and recommending the best location for the solar array.

<u>The business case should cover:</u>

- ❑ Why should TPVC consider solar power generation above all other energy sources
- ❑ Analysis of historical revenue from existing MD commercial solar plants
- ❑ Estimate Capital Expense (CapEx) and Operating Expense (OpEx) for building and operating a solar field
- ❑ Projection of solar energy revenue and costs
  - ❑ 5-years (2026)
  - ❑ 10 years (2031)
- ❑ Projected break-even point
- ❑ Create TPVC's Go-to-market strategy in order to secure the position as Maryland's Solar Energy Provider

Releasing…the Data

Data	Value / Link
PV Energy Generation (MD) [Google Drive]	http://bit.ly/datathonpvdata
Solar Array Generation	https://pvwatts.nrel.gov/index.php
Land Cost ($/acre)	Western: $5,077; Central: $8,475; Northern: $10,517; Southern: $9,622; Eastern: $6,650
Solar Panel Costs ($/W)	$2.96
Electricity Cost ($/MWh)	$0.10/KwH ($100.00/MWh)
Solar Renewable Energy Credit (SREC)	$75 / MWh (SREC Background)
Database of State Incentives for Renewables & Efficiency (DSIRE)	https://www.dsireusa.org/

eia

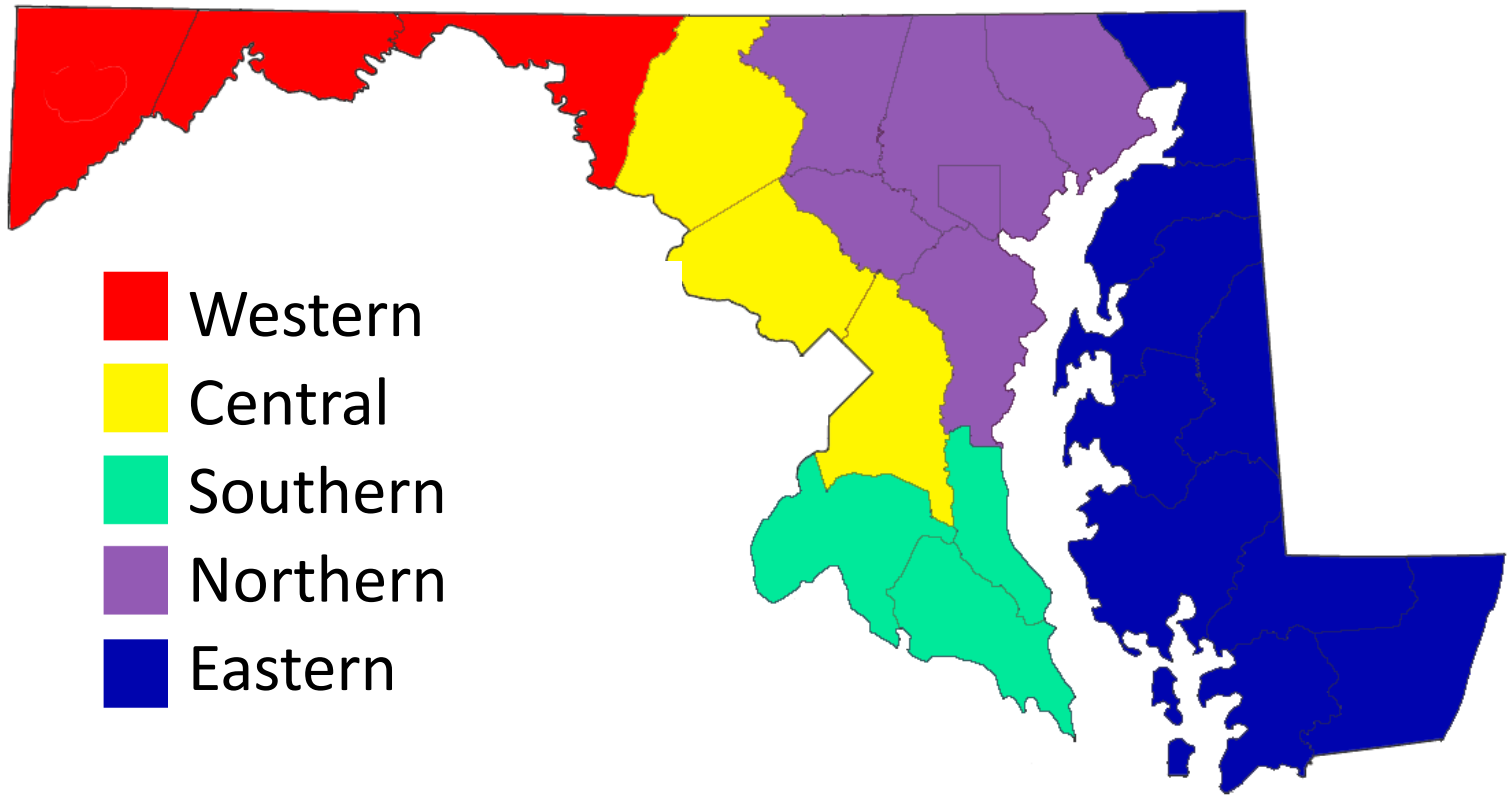
NREL Transforming ENERGY

DSIRE insight

Data Dictionary – Monthly Electricity Generation

Column	Description
PlantID	EIA Plant Identification number. One to five digit numeric.
Combined Heat & Power Plant	Whether or not the plant is a combined heat & power facility (cogenerator).One character alphanumeric, “Y” or “N”
Plant Name	Plant name. Alphanumeric
Operator Name	The name of the entity which operates the plant. Alphanumeric.
Operator ID	The EIA operator identification number. Five digit numeric, padded with leading zeros.
Reported Primer Mover	Type of prime mover: PV = Photovoltaic
Reported Fuel Type Code	The fuel code reported to EIA. Two or three letter alphanumeric:
AER Fuel Type Code	A partial aggregation of the reported fuel type codes into larger categories used by EIA in, for example, the Annual Energy Review (AER).Two or three letter alphanumeric.
QUANTITY_[Month]	Consumption of the fuel type in physical units. Numeric. Note: this is the total quantity consumed for both electricity and, in the case of combined heat and power plants, process steam production.
ELEC_QUANTITY_[Month]	Consumption for electric generation of the fuel type in physical units.Numeric.
MMBTU_PER_UNIT_[Month]	Heat content of the fuel in millions of Btus per physical unit.Numeric.
TOT_MMBTU_[Month]	Total consumption of the fuel in millions of Btus. Numeric Note: this is the total quantity consumed for both electricity and, in the case of combined heat and power plants, process steam production.
ELEC_MMBTUS_[Month]	Consumption of fuel in millions of Btus for the purpose of generating electricity. These fields are most relevant to combined heat and power plants. For non-combined heat and power plants, the data in these fields and in columns AK through AV (total fuel consumed) will be identical.
NETGEN_[Month]	Net generation of electricity in megawatthours (MWh).Numeric. This is total electrical output net of station service. In the case of combined heat and power plants, this value is intended to include internal consumption of electricity for the purposes of a production process, as well as power put on the grid.
TOTAL FUEL CONSUMPTION QUANTITY	Total consumption of fuel in physical units, year to date.Numeric Note: this is the total quantity consumed for both electricity and, in the case of combined heat and power plants, process steam production.
ELECTRIC FUEL CONSUMPTION QUANTITY	Total consumption of fuel to produce electricity, in physical units, year to date. Numeric
TOTAL FUEL CONSUMPTION MMBTUS	Total consumption of fuel in MMBtus, year to date. Numeric Note: this is the total quantity consumed for both electricity and, in the case of combined heat and power plants, process steam production.
ELEC FUEL CONSUMPTION MMBTUS	Consumption of fuel in millions of Btus for the purpose of generating electricity, year to date. This field is most relevant to combined heat and power plants. For non-combined heat and power plants, the data in this field and in column BV (total fuel consumed) will be identical.
NET GENERATION (megawatthours)	Net generation, year to date in megawatthours (MWh).Numeric. This is total electrical output net of station service. In the case of combined heat and power plants, this value is intended to include internal consumption of electricity for the purposes of a production process, as well as power put on the grid.
Year	Calendar Year for Data

Regions of Maryland



Team Assignments

Team #	Team Member	Team Member	Team Member	Team Member	Team Member
Team 1	Adam Elshafei	Annabelle Baer	Justyn Alexander	Jason Eisen	
Team 2	Ryan Carfora	Julia Escarda	Preritha Konanur	Winston Hoch	
Team 3	Xiuwei Li	Melis Tuman	John Nidds	Yo Sasatomi	
Team 4	Alexander Leipold	Varsha Ramachandran	Faaiq Zarger	Marianne Benyamin	Adina Arnet
Team 5	Ilona Sirotinin	Alaina Cohen	Claire Lee	Austin Wenck	
Team 6	Justin Friedman	Ryan Finley	Loretto-Marie McInerney	Shuhan Yang	
Team 7	Sarah Patrick	Yasmine Talaminaei	Samuel Ballai	Divya Kapoor	
Team 8	Sarah Alkon	Zoe Rader	Matthew Glady	Haley O'Reagan	

Team Assignments

Team #	Team Member	Team Member	Team Member	Team Member	Team Member	Team Member
Team 9	Pradeep Govindaraj	Yi-Hsuan Chen	Jiacheng Liu	Li-Chih Wang	Ting-Yu Liu	Hao Wu
Team 10	Dacruz Norberto	Shantanu Rajesh Patil	Nephi Bradley	Matthew Talley		
Team 11	Navina Kaur Sethi	Ellen Zhang	Zhuxuan Xu	Maryam Soomro	Huile Zhou	Yahui Chang
Team 12	Annie Hu	Jonathan K Kesten	Paul Newcom	Jingmei Wei	Phuong Huynh	Weiyu Lin
Team 13	Zizheng Wang	Jason S Eisen	Ryan Carfora	Dan Peng	Huan Deng	Ruoning Che

Technical Support

Facing a technical issue? Can't access the data? Tableau won't load? Reach out to the tech support email box below!

umddatathontechinquiry@gmail.com

Note: To provide an equal playing field, please refrain from asking for technical guidance for your solution.

Additional Resources

Topic	Link/ Resource	Resource Description
Data Visualization	Tableau Desktop: https://www.tableau.com/learn/training	Training resources for two of the leading data visualization platforms on the market today.
Google Colab	https://research.google.com/colaboratory/faq.html	Frequently asked questions regarding Google Colab and it's capabilities
Core Consulting Series (CCS) Modules	http://bit.ly/datathonCCS	A consolidated resource deck containing the outcomes from the CCS workshop on 3/1.
Technical Support Mailbox	**umddatathontechinquiry@gmail.com**	Technical support resource for any issues pertaining to access to data, technology issues, etc.

Datathon | Robert H. Smith School of Business
Questions

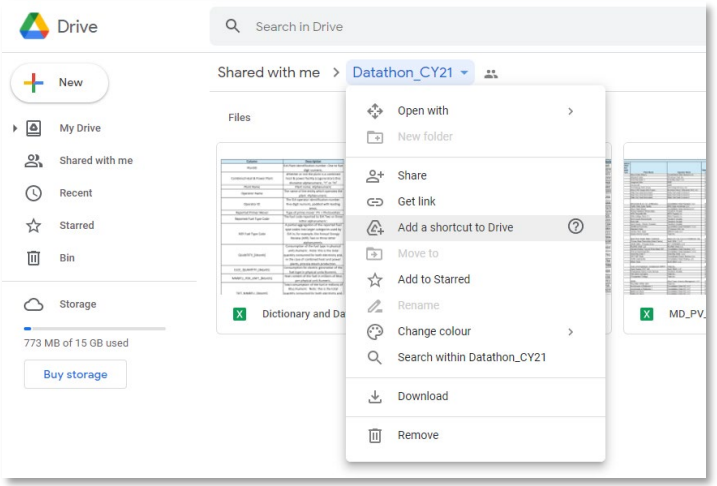
How To:
Connect Google Colab to Google Drive

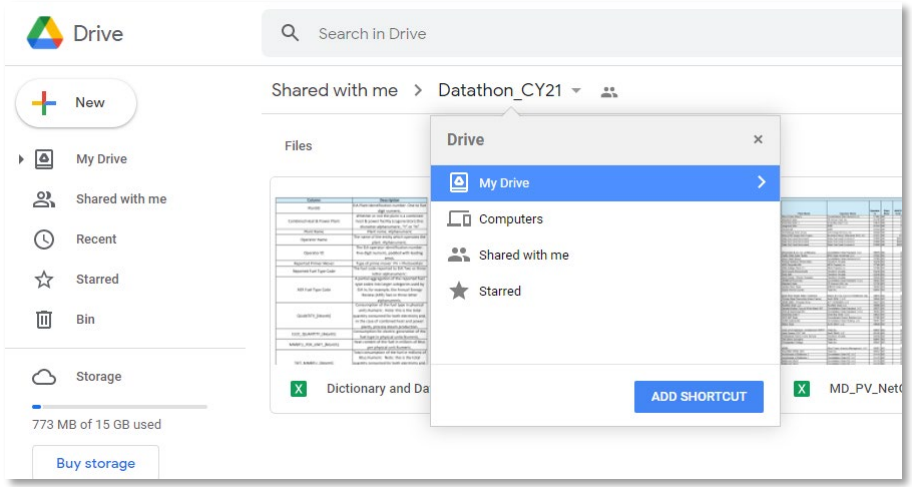
1 – Add Datathon Files to MyDrive

1. Open the Shared Datathon ‘Dathathon_CY21’ file
2. Select ‘Add shortcut to Drive.’
3. Select ‘My Drive’ and ‘Add Shortcut’

Open My Drive to verify that the files have been

Successfully added.

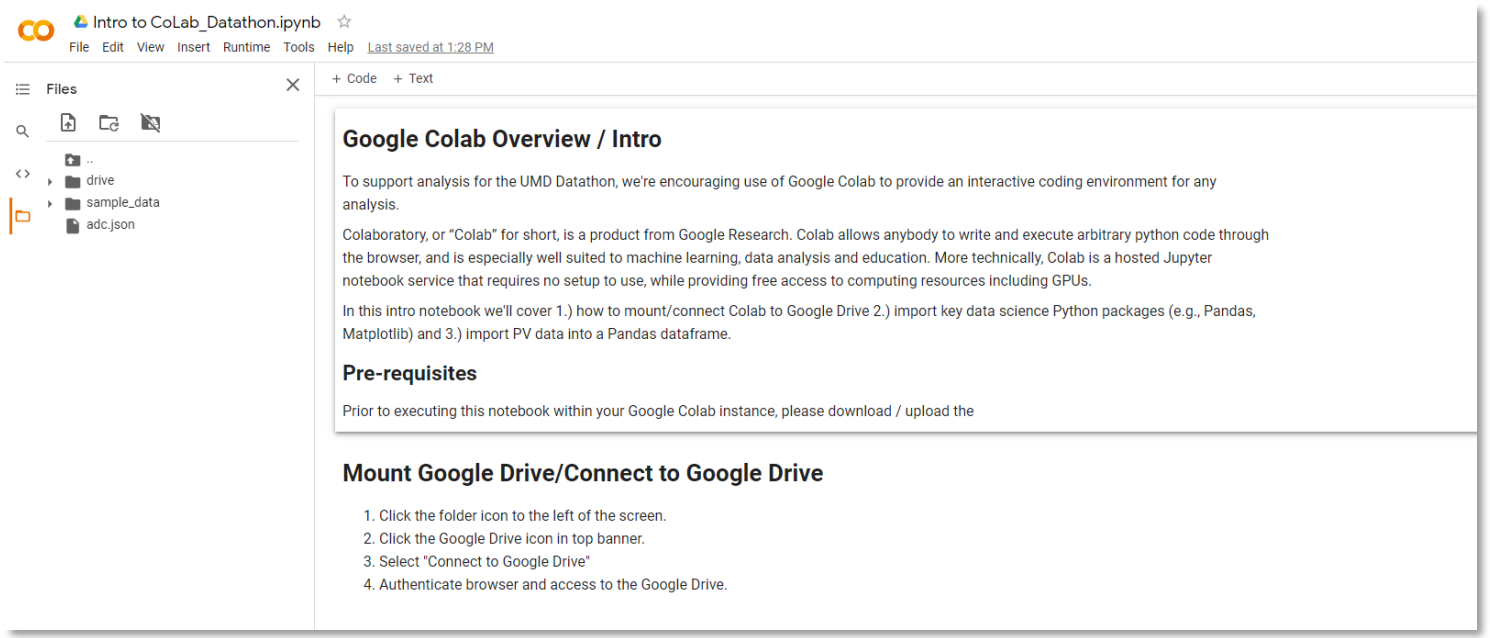




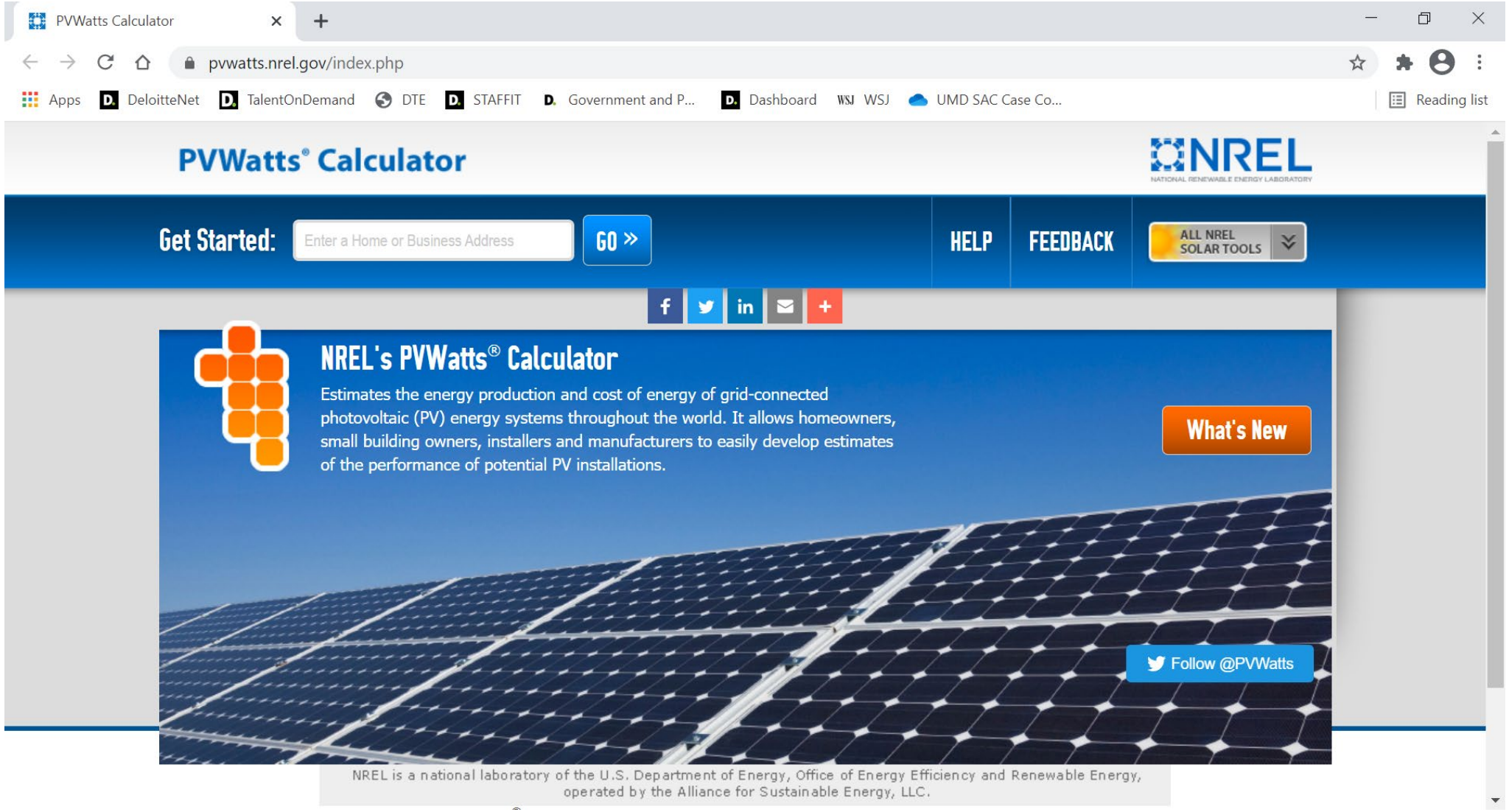
2– Follow Notebook Directions in 'Intro to CoLab_Datathon_ipynb' to Connect CoLab

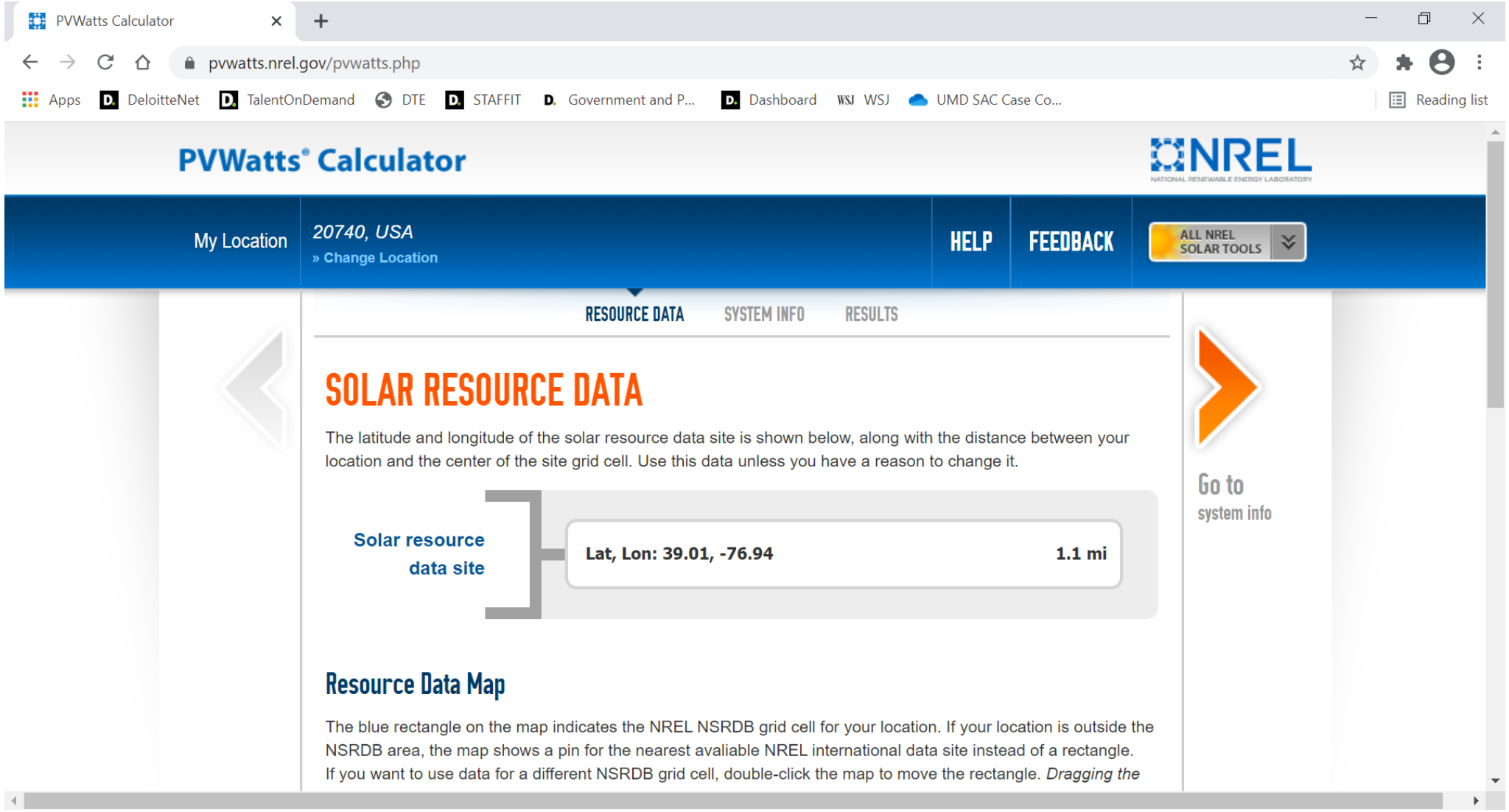
The notebook will walk you through the following:

- Mounting Google Drive/Connecting to Google Drive
- Setting the directory
- Checking Google Drive Contents to ensure necessary files are present
- Importing data



How To:
Create a PV Model on PVWatts


PVWatts Calculator
pvwatts.nrel.gov/index.php
Apps
DeloitteNet
TalentOnDemand
DTE
STAFFIT
Government and P...
Dashboard
WSJ
UMD SAC Case Co...
Reading list
PVWatts® Calculator
NREL
NATIONAL RENEWABLE ENERGY LABORATORY
Get Started:
Enter a Home or Business Address
GO »
HELP
FEEDBACK
ALL NREL SOLAR TOOLS
NREL's PVWatts® Calculator
Estimates the energy production and cost of energy of grid-connected photovoltaic (PV) energy systems throughout the world. It allows homeowners, small building owners, installers and manufacturers to easily develop estimates of the performance of potential PV installations.
What's New
Follow @PVWatts
NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.


PVWatts Calculator
pvwatts.nrel.gov/pvwatts.php
Apps
DeloitteNet
TalentOnDemand
DTE
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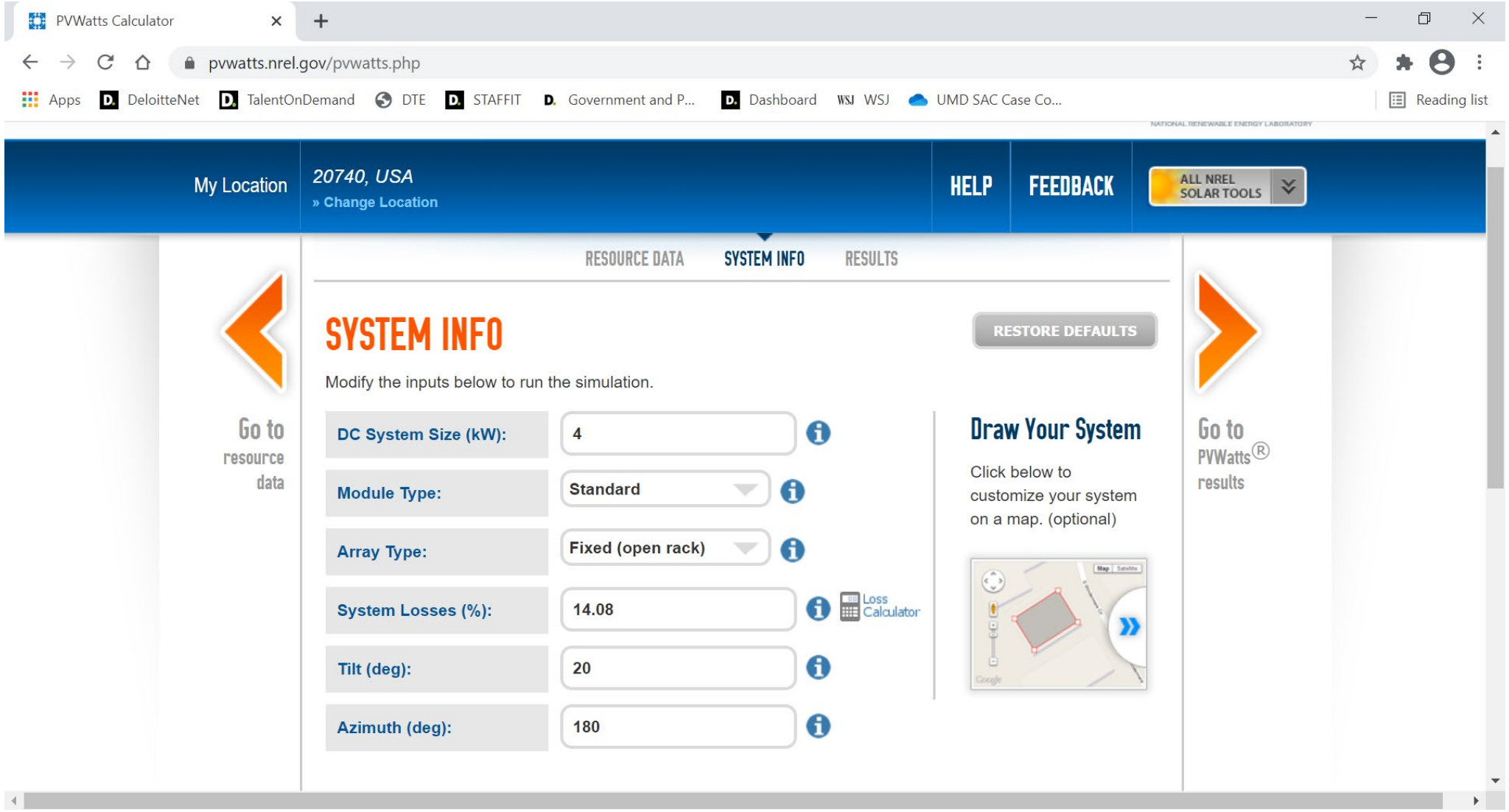
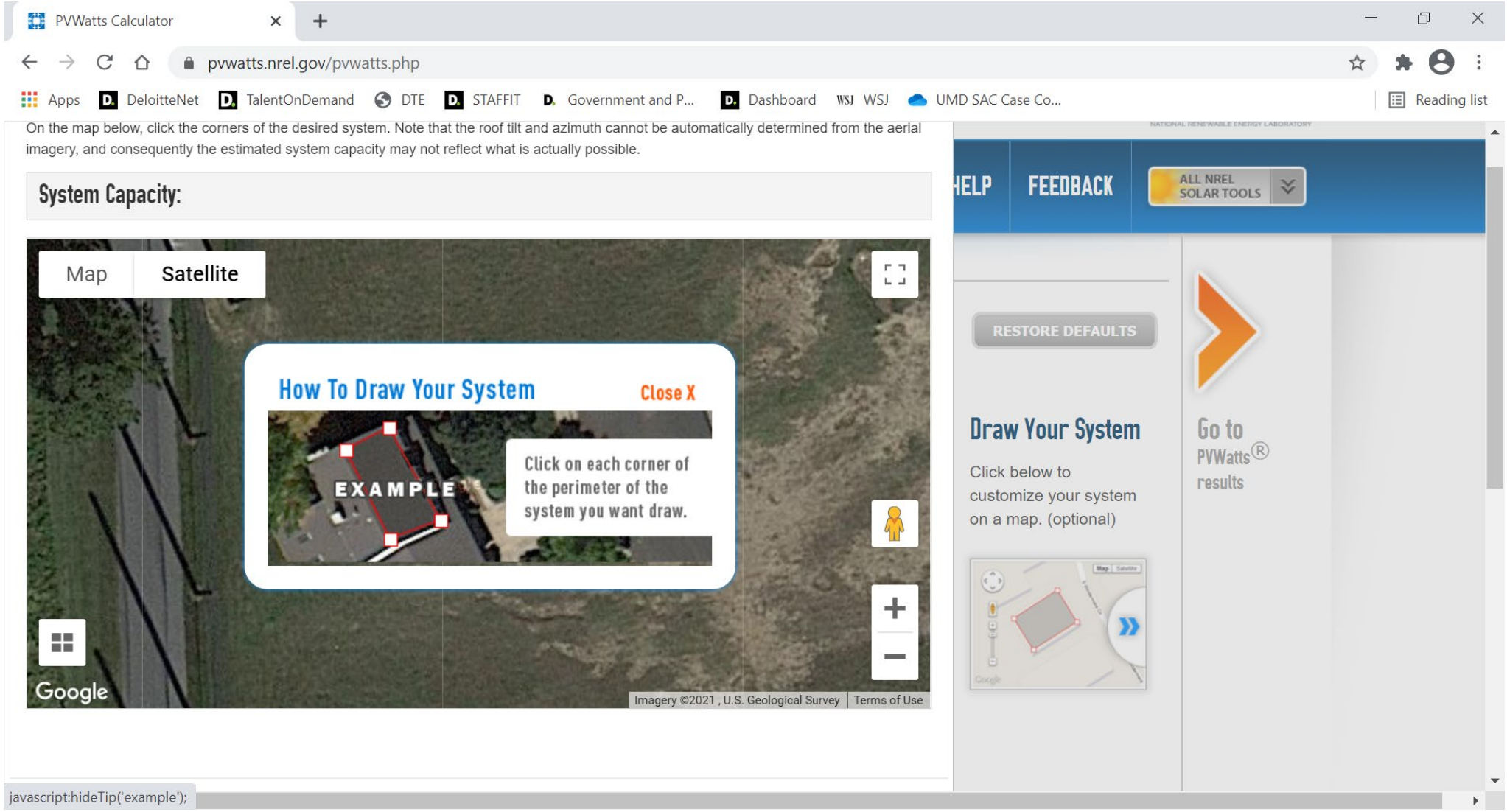
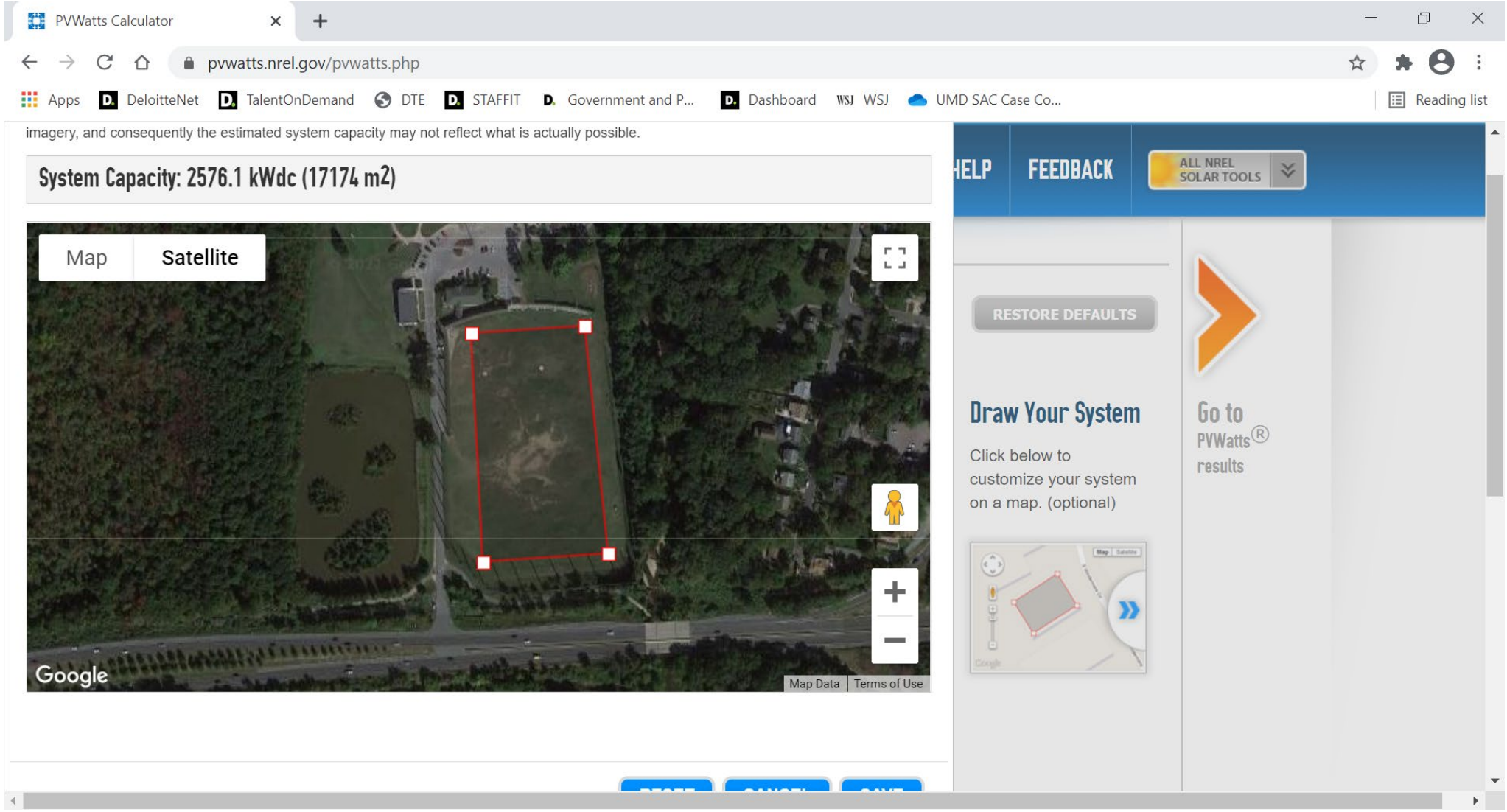
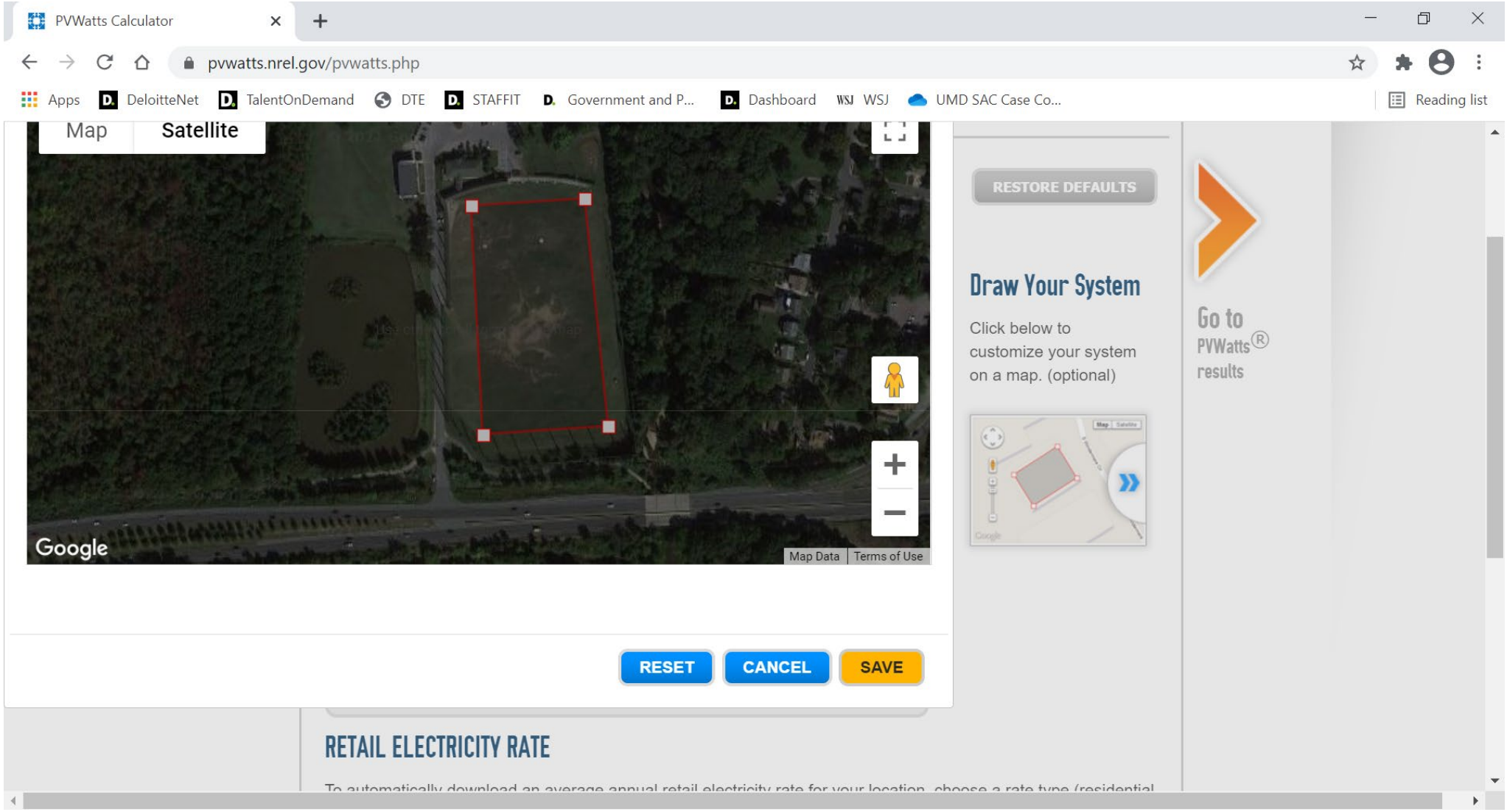
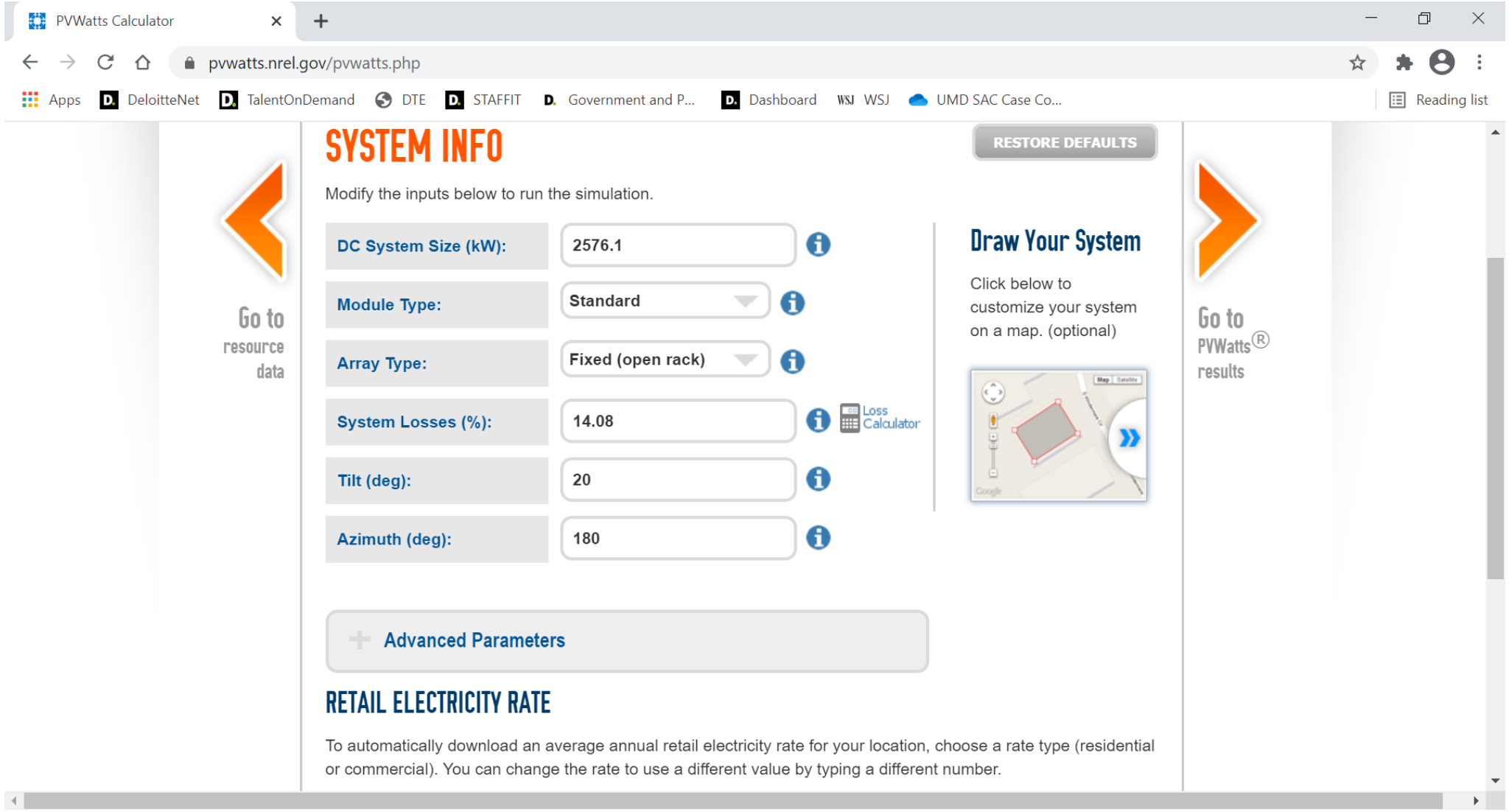
Dashboard
WSJ
UMD SAC Case Co...
Reading list
PVWatts® Calculator
NREL
NATIONAL RENEWABLE ENERGY LABORATORY
My Location
20740, USA
» Change Location
HELP
FEEDBACK
ALL NREL SOLAR TOOLS
RESOURCE DATA
SYSTEM INFO
RESULTS
SOLAR RESOURCE DATA
The latitude and longitude of the solar resource data site is shown below, along with the distance between your location and the center of the site grid cell. Use this data unless you have a reason to change it.
Solar resource data site
Lat, Lon: 39.01, -76.94
1.1 mi
Go to system info
Resource Data Map
The blue rectangle on the map indicates the NREL NSRDB grid cell for your location. If your location is outside the NSRDB area, the map shows a pin for the nearest avaliable NREL international data site instead of a rectangle. If you want to use data for a different NSRDB grid cell, double-click the map to move the rectangle. Dragging the


PVWatts Calculator
pvwatts.nrel.gov/pvwatts.php
Apps
DeloitteNet
TalentOnDemand
DTE
STAFFIT
Government and P...
Dashboard
WSJ
UMD SAC Case Co...
Reading list
My Location
20740, USA
» Change Location
HELP
FEEDBACK
ALL NREL SOLAR TOOLS
RESOURCE DATA
SYSTEM INFO
RESULTS
SYSTEM INFO
RESTORE DEFAULTS
Modify the inputs below to run the simulation.
DC System Size (kW): 4
Module Type: Standard
Array Type: Fixed (open rack)
System Losses (%): 14.08
Loss Calculator
Tilt (deg): 20
Azimuth (deg): 180
Draw Your System
Click below to customize your system on a map. (optional)
Go to resource data
Go to PVWatts® results


PVWatts Calculator
pvwatts.nrel.gov/pvwatts.php
Apps
DeloitteNet
TalentOnDemand
DTE
STAFFIT
Government and P...
Dashboard
WSJ
UMD SAC Case Co...
Reading list
On the map below, click the corners of the desired system. Note that the roof tilt and azimuth cannot be automatically determined from the aerial imagery, and consequently the estimated system capacity may not reflect what is actually possible.
System Capacity:
Map
Satellite
How To Draw Your System
Close X
EXAMPLE
Click on each corner of the perimeter of the system you want draw.
Google
Imagery ©2021 , U.S. Geological Survey
Terms of Use
HELP
FEEDBACK
ALL NREL SOLAR TOOLS
RESTORE DEFAULTS
Draw Your System
Click below to customize your system on a map. (optional)
Go to PVWatts® results
javascript:hideTip('example');


PVWatts Calculator
pvwatts.nrel.gov/pvwatts.php
Apps
DeloitteNet
TalentOnDemand
DTE
STAFFIT
Government and P...
Dashboard
WSJ
UMD SAC Case Co...
Reading list
imagery, and consequently the estimated system capacity may not reflect what is actually possible.
System Capacity: 2576.1 kWdc (17174 m2)
Map
Satellite
Google
Map Data
Terms of Use
HELP
FEEDBACK
ALL NREL SOLAR TOOLS
RESTORE DEFAULTS
Draw Your System
Click below to customize your system on a map. (optional)
Go to PVWatts® results


PVWatts Calculator
pvwatts.nrel.gov/pvwatts.php
Apps
DeloitteNet
TalentOnDemand
DTE
STAFFIT
Government and P...
Dashboard
WSJ
UMD SAC Case Co...
Reading list
Map
Satellite
Google
Map Data
Terms of Use
RESTORE DEFAULTS
Draw Your System
Click below to customize your system on a map. (optional)
Go to PVWatts® results
RESET
CANCEL
SAVE
RETAIL ELECTRICITY RATE

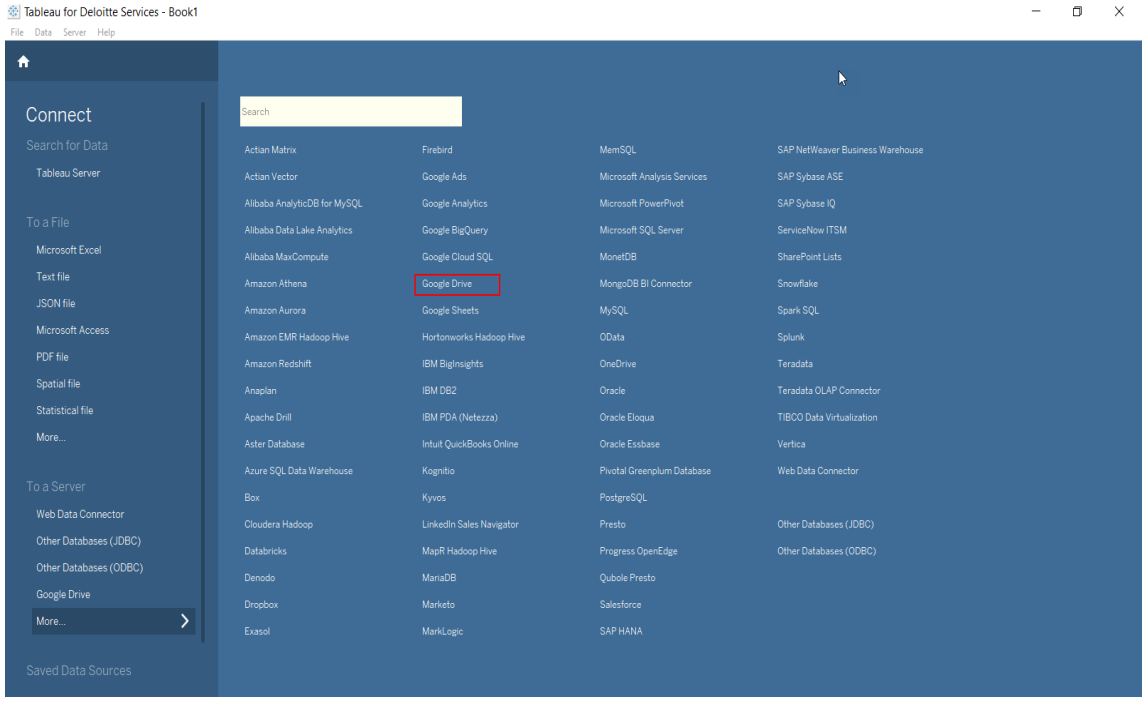

PVWatts Calculator
pvwatts.nrel.gov/pvwatts.php
Apps
DeloitteNet
TalentOnDemand
DTE
STAFFIT
Government and P...
Dashboard
WSJ
UMD SAC Case Co...
Reading list
SYSTEM INFO
RESTORE DEFAULTS
Modify the inputs below to run the simulation.
DC System Size (kW): 2576.1
Module Type: Standard
Array Type: Fixed (open rack)
System Losses (%): 14.08
Loss Calculator
Tilt (deg): 20
Azimuth (deg): 180
Draw Your System
Click below to customize your system on a map. (optional)
Go to resource data
Go to PVWatts® results
Advanced Parameters
RETAIL ELECTRICITY RATE
To automatically download an average annual retail electricity rate for your location, choose a rate type (residential or commercial). You can change the rate to use a different value by typing a different number.

How To:
Connect Tableau to Google Drive

1 – Open Tableau and Select Data Connector

This guide will walk you through how to connect Tableau to the Google Drive that is hosting the data for the Datathon. Prior to running through the following steps, please download and store the Datathon data within your own Google Drive account.

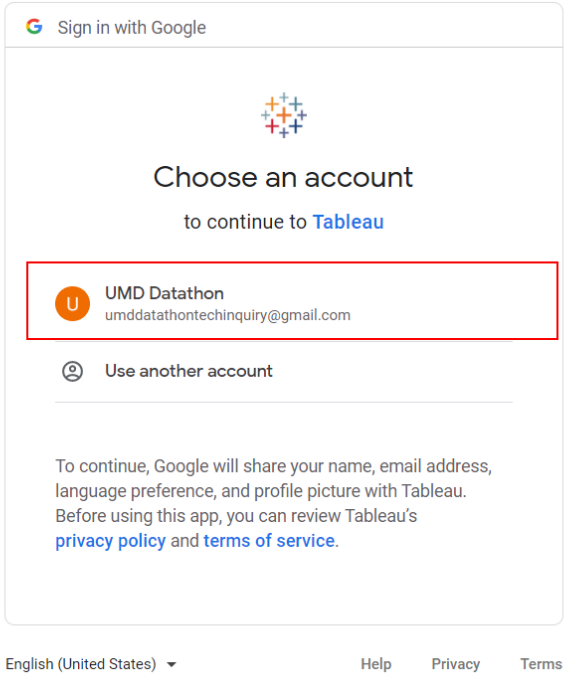
Next, open Tableau and on the left side under "**To a Server**" select "**Google Drive**." If not shown in the list, select "**More…**" and identify "Google Drive" from the list of options.

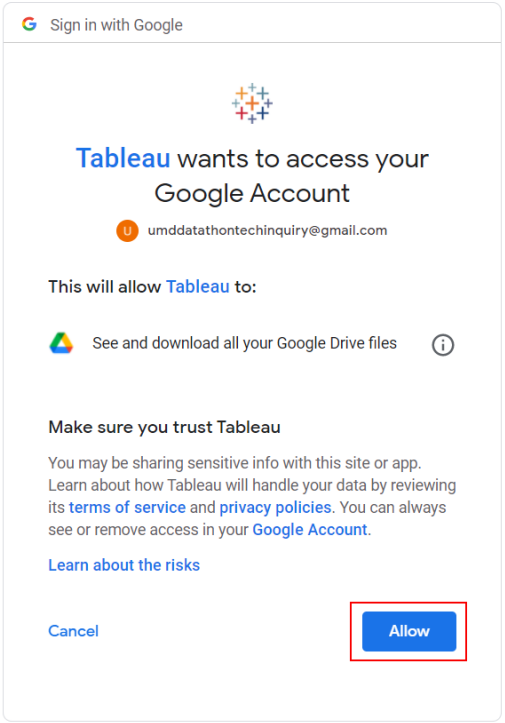


2a – Log-in to Google Account (student email)

After selecting "Google Drive" from the options menu, you'll be prompted to log-in to your Google account. Please use the email you signed-up for the competition with (i.e. *@rhsmith.umd.edu, *@terpmail.umd.edu, *@gmail.com)**

** If you did not sign-up to the Datathon with your University email / Gmail account, please contact the Datathon Help Desk.



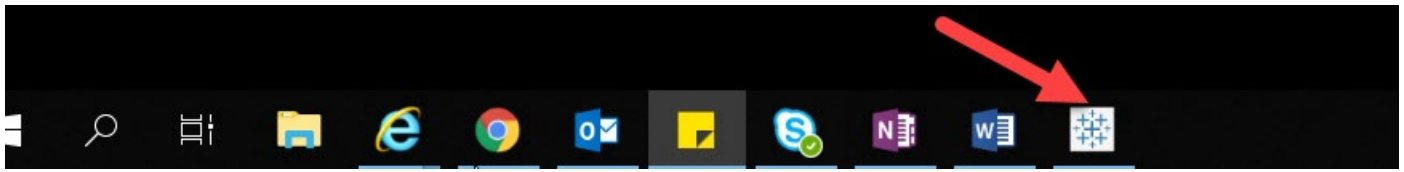


2b – Close out of Browser; Access Tableau

Once signed into your Google Account, you'll be prompted that the browser window will close, you may close your browser at this moment.

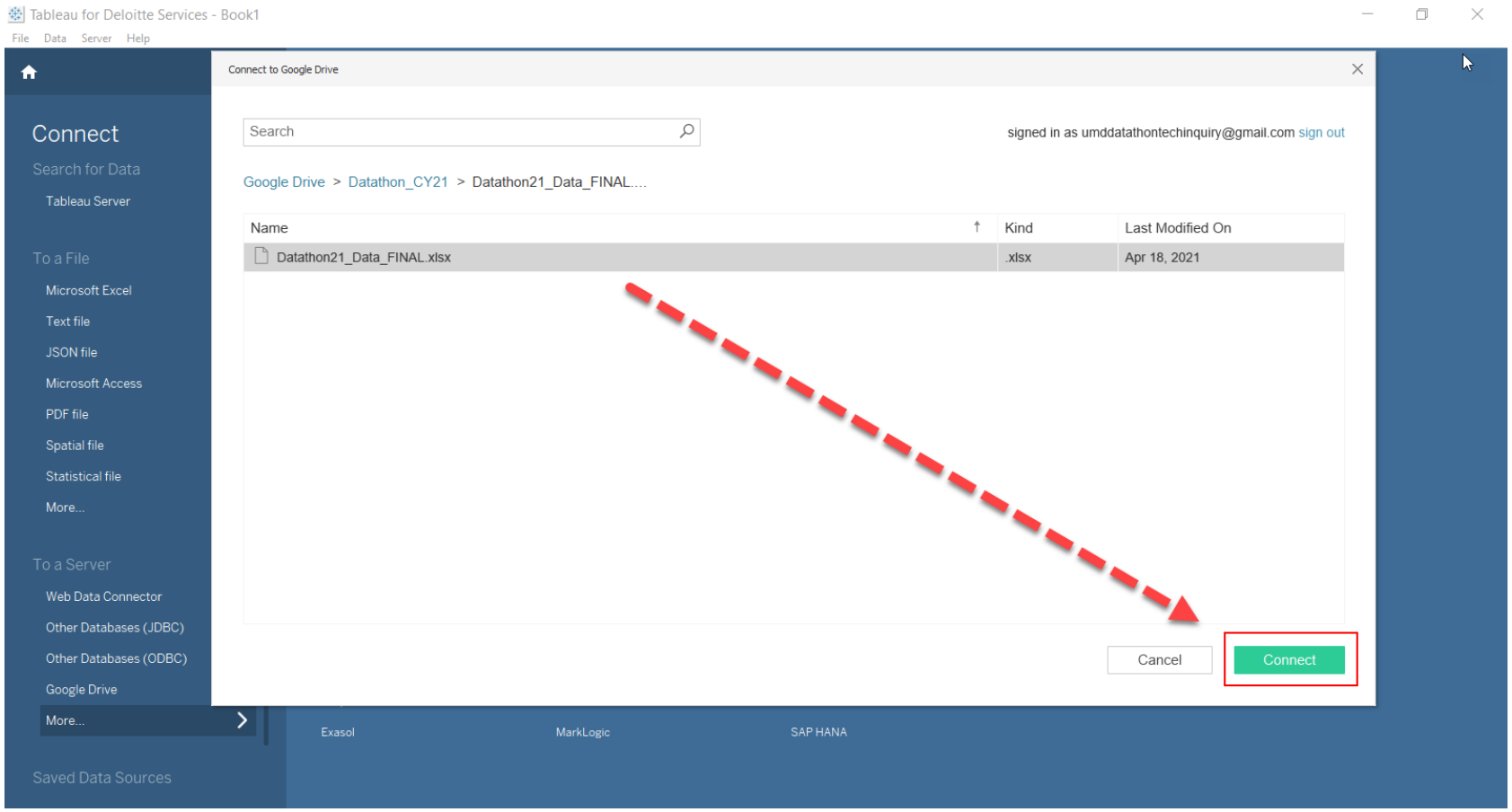
Tableau created this window to authenticate. It is now safe to close it.

On the task bar, locate the 'Tableau' application and click.



3 – Connect to the Datathon Data in Google Drive

Navigate back to Tableau and locate the 'Datathon21_Data_FINAL.xlsx' file within your Google Drive. Select the file and then click 'Connect' to connect Tableau to the data.



4 – Add a Table

After confirming the dataset, three tables should populate on the left panel: **Data Dictionary, MD PV Data** and **MD PV Locations**. Click and drag one of the tables into the top input area, and the data should populate into the table view.

Congrats, you've connected Tableau to Google Drive! Good luck with your analysis.