Booz | Allen | Hamilton

DEPARTMENT OF STATE CLEAN ENERGY DATA SCIENCE CHALLENGE

STARTER KIT FOR PARTICIPANTS

March 31- April 2
San Francisco

Preliminary Schedule

TIMES	ACTIVITY
Friday, 31 March	
6:00PM	Registration Opens
6:00PM – 8:00PM	Happy Hour / Meet & Greet / Begin Forming Teams
7:00PM	Welcome Remarks by Brian MacCarthy, Booz Allen Hamilton & Ambassador U Aung Lynn (recording)
Saturday, 1 April	
9:00AM	Registration & Continental Breakfast
9:30AM – 10:00AM	Event Kick-off & Opening Keynote by Molly Ward, US Dept of State & Shoon So Oo, WWF (recording)
10:00AM – 10:15AM	Lightning Talks Detailing Challenges & Opportunities
10:15AM – 12:00PM	Problem-based Pitches from Participants, Mixing & Final Team Registration
12:00PM – 1:00PM	Lunch & Keynote by Yann Tanvez, Team Lead, Energy Open Data & Analytics, World Bank
1:00PM – 8:00PM	Hacking + Mentoring by Subject Matter Experts (SMEs)
6:00PM – 7:00PM	Optional Practice Pitching & Feedback Session
8:00PM	Building Closes
Sunday, 2 April	
8:00AM	Doors Open & Continental Breakfast
8:00AM – 1:00PM	Hacking + Mentoring by SMEs
12:00PM – 1:00PM	Lunch & Keynote by Emily Kirsch, Founder & CEO of Powerhouse
1:00PM	Submissions Due and Demo Presentations Begin
2:00PM	Judging Deliberation
2:30PM	Announcement of Winners!
3:00PM	Closing Remarks – Where We Go From Here

All events take place at the Galvanize Campus (44 Tehama St, San Francisco, CA 94105)

galvanize

Frequently Asked Questions

Selected FAQs

- **Do I need to come with a team already formed? –** No, time has been set aside in the schedule for meeting other participants and forming teams. However, you are welcome to come with pre-formed teams as well, and there also will be an opportunity for participants to "pitch" initial ideas or hypotheses to find others who want to partner. Team size will be capped at 8.
- **Can I participate remotely?** – This event is only open for in-person participation at the Galvanize campus in San Francisco (44 Tehama St, 94105).
- **Do I need to do anything before the Challenge kick-off?** – The data will be made available to participants via the Sailfish platform from 09:00 PST on Thursday, 30 March. If possible, we ask for participants to sign up for their Sailfish account at energytechchallenge.sailfish.boozallen.com in advance to streamline registration.
- **What if I'm new to data science or don't have enough experience? –** We've designed this challenge and the use cases to be inclusive and open to all skill sets, so don't let this hold you back!
- **Who are the judges and mentors, and when are office hours?** – Judges and mentors are comprised of subject matter experts (SMEs) drawn from across the energy development, finance, international development, data science and related fields. They'll be on-site to provide guidance to teams throughout the weekend. Office hours will run throughout Saturday and Sunday.
- **What if I can only attend for part of the event?** – It is important for attendees to participate across the full event, however we will do our best to work around any participant schedule conflicts throughout the weekend.
- **Who do I contact if I have more questions?** – Drop us a line at energytechchallenge@bah.com – we're looking forward to meeting you!

Event Overview

Why We're Here Today

- This Challenge is a follow-on to the Silicon Valley Tech Challenge hosted at UC Berkeley in September 2016 and is jointly hosted by Booz Allen Hamilton, the US Department of State's Bureau of Energy Resources, the World Bank and Galvanize.
- The two-day event is designed for start-ups, students, entrepreneurs and others to come together and use data science – especially geospatial analysis – to increase visibility into renewable energy development potential and help expand access to energy to the 2 billion people who lack electricity or lack reliable electricity around the world.
- Desired outcomes include identifying datasets and developing new algorithms, programs and applications that can be used by developers, NGOs, government entities to reduce barriers to investment and facilitate the development of small-scale solar and sustainable micro-grid systems, resulting in improved energy access.
- A multitude of different open source datasets have been assembled and organized to enable participants to come up with innovative solutions to three specific use cases designed to address the barriers to clean energy development.
- Myanmar (Burma) has been selected as the event's target use case given the country's recent democratic transition, significant electrification needs and potential for off-grid renewables.

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Over two billion people globally lack access to reliable electricity, with impacts on education, health, social and economic development

The Impact of Poor Energy Access

- Over **one billion people globally lack access to electricity and another billion lack access to reliable electricity**.
- Providing **access to energy can enable progress** across the education, health, social, and economic sectors.
- **Innovative and scalable solutions are needed to meet the drastically rising demand for electricity** across the developing world, as well as the imperative to **reduce energy price volatility** and **increase energy security.**
- **This global problem presents a market opportunity**, as many developing countries rely on outside developers and expertise to provide innovation solutions and services.

Access to timely and reliable data about renewable development potential is a major barrier to the expansion of energy access

Implications of Data Constraints

Lack of data and the ability to quickly analyze it prevents developers, investors, development organizations, government agencies and others from answering critical questions, such as:

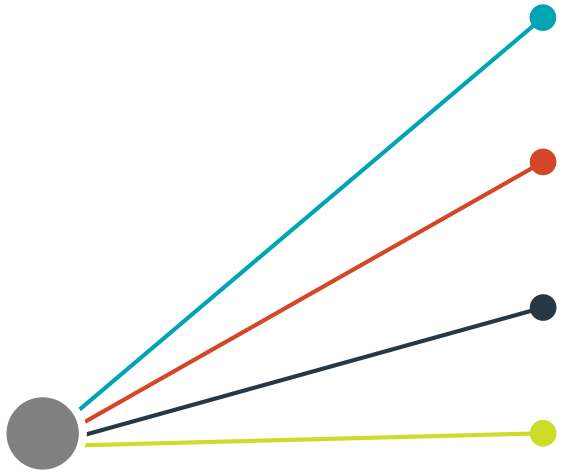
- ***Who Needs It the Most?*** – Household data to help identify those most in need – particularly in rural areas – is often lacking, preventing the full impact of humanitarian assistance projects sponsored by NGOs, development banks and others.

- ***Who Can Pay? –*** A lack of access to reliable, real-time data and analysis about users' ability to pay prevents energy developers and investors from being able to accurately access the commercial viability of a given project.

- ***Where Should We Build? –*** Qualitative, quantitative and geospatial data for helping determine renewable energy potential for a given site or project are often either lacking or incomplete, and the cost to collect or acquire necessary data is often prohibitive.

This Challenge will explore ways for data scientists, using open source data, to map out a country's renewable energy development potential

How Data Science Can Disrupt Business As Usual



Current data collection and analysis methods can last months to years; we hope data science can disrupt business as usual in just a few days

This event will **explore how data science could be used – in particular geospatial analysis –** to more easily and cost-effectively give a quick picture **of renewable energy development potential**

Potential solutions could **reduce up-front financing risk** for electrification projects by **better assessing** the **commercial viability** of projects **and those most in need**

Organizers of the event also hope the challenge can **start a movement in the renewable energy community for better data sharing**

There are many stakeholders who will benefit from the Challenge results, helping with the goal of providing increased energy access to end-users

Stakeholders Summary

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Developers

Investors

NGOs / Donors

Governments

	Developers	Investors	NGOs / Donors	Governments
Key Questions	At a high-level, where should I build?	What's the overall opportunity?	Where are people in most need?	Who needs electricity the most and what type do they need?
	What towns, & specifically, what sites?	Where can users afford to pay?	What are other donors doing in this space?	What is the least cost technology option so to prioritize funds?
Goal	**Assess development potential and commercial viability**	**Minimize investment risk and improve due diligence**	**Increase visibility into projects and expand energy access for all**	**Improve national energy strategy and policies**

To focus our efforts, three use cases have been identified to help determine i) who needs electricity, ii) who the customers are, and iii) where to build

1. "Who Needs Electricity" – Map off-the-grid households

Map which households (and/or businesses) are not connected to the national grid in order to help the government, NGOs and other energy developers determine the areas most in need

- *An ideal solution would be an application that provides an interactive way for stakeholders to identify the areas of greatest electricity need (potentially overlaid with data to also assess each area's renewable development potential)*

2. "Who Are Customers and How Can they Pay?" – Develop customer profiles

Analyze household level data and use that information to inform your assumptions and predict who and where customers are and the ability to pay for different customer segments, which can then be used to assess the commercial viability for projects

- *An ideal solution would be an interactive application that develops customer profiles and predicts these users' ability to pay*

3. "Where to Go" – Identify top areas for resource development potential*

Identify where developers should go by analyzing data to assess an area's resource potential (i.e. is there solar or wind available), grid interconnectivity and infrastructure, and other factors important to investors and developers that influence a "go/no go" decision for micro-grids or small-scale solar

- *An ideal solution would be an application that provides an interactive way for stakeholders to identify sites for development for small-scale solar and micro-grids*

**Note: Use case #3 may encompass #1 and #2, and is considered a higher level of difficulty*

Initial open source datasets have been assembled to help guide the solution development process

About the Data

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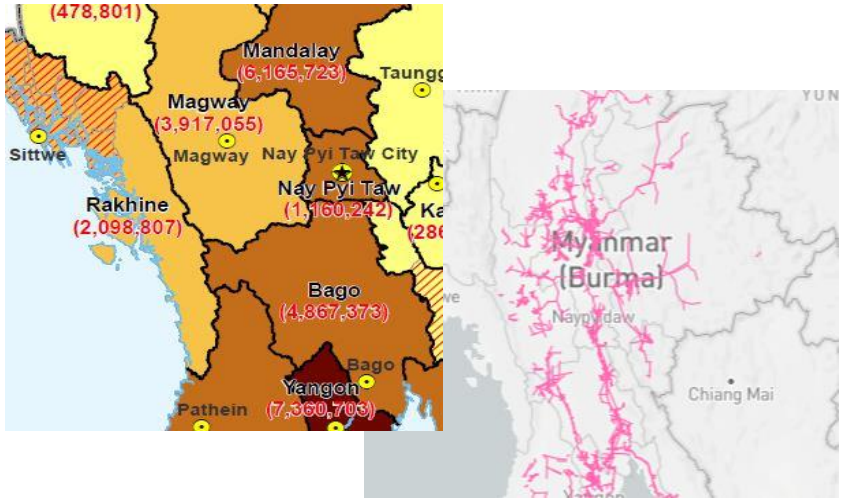
For this challenge, organizers collected and uploaded data in categories important to developers, investors, donors and other stakeholders when they decide to pursue a project

GIS and spatial data are important in this type of energy planning; however its use in the energy access space is still in its infancy



Assembled Data Sources*

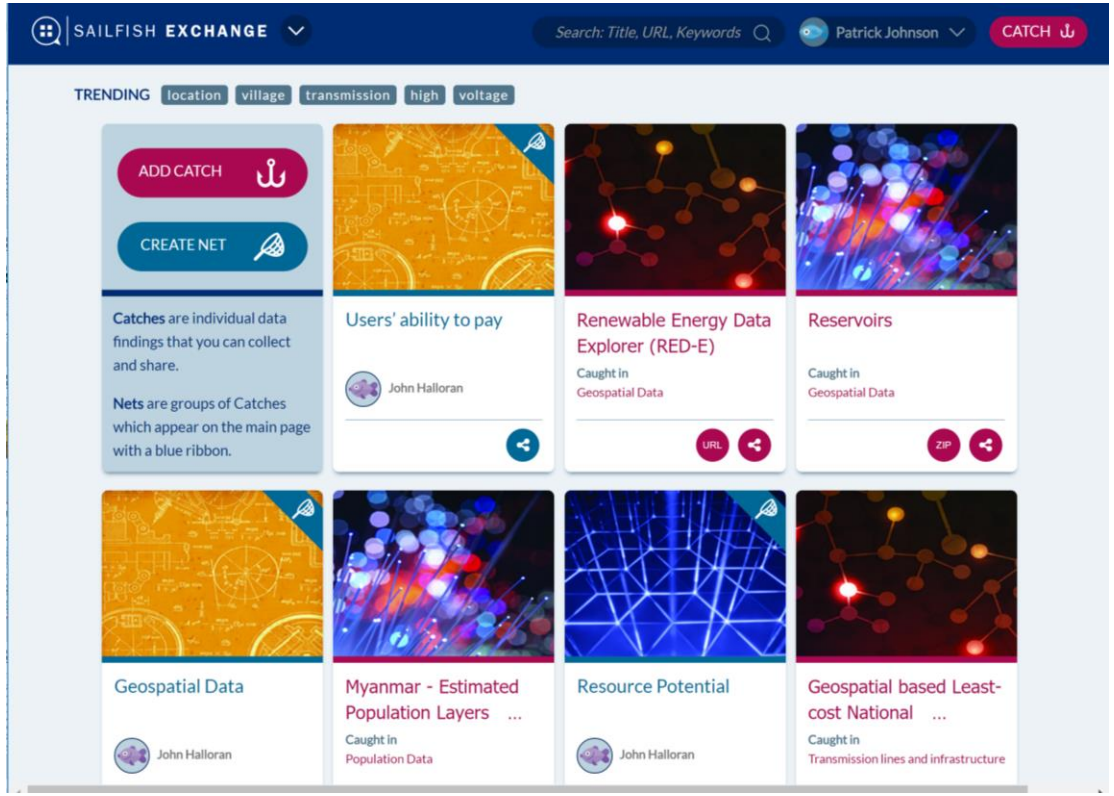
- **Resource potential** (Source : USAID/NREL (Renewable Energy Data Explorer), Global Reservoir & Dam Database (NASA), World Bank)
- **Transmission lines and infrastructure** (Source : CARMA.org, Sustainable Engineering Lab/Earth Institute, Resource and Environment Myanmar (REM))
- **Roads** (Source : DIVA-GIS)
- **Regulatory and business climate** (Source : World Bank, ClimateScope)
- **Population data** (Source: World Bank, UN MIMU, LandScan, Open Development Myanmar))
- **Users' ability to pay** (Source: World Bank, UN MIMU)
- **Least Cost Technology Option** (Source: World Bank)
- ***Additional geospatial data:*** *Participants may also look to Geoplatform.gov, Google Earth Engine, USAID GeoCenter, SolarGIS, & ESMAP for alternative datasets. Please note some require accounts set up in advance*

**** Visit energytechchallenge.sailfish.boozallen.com and register for an account to access datasets (see slide 12)***

Booz Allen's Sailfish platform will facilitate data sharing and submissions - accounts can be configured at energytechchallenge.sailfish.boozallen.com

Technical Guidance

- Data will be accessed using Booz Allen's Sailfish Exchange platform
- To sign up for an account, please go to energytechchallenge.sailfish.boozallen.com. The Sailfish platform will allow access beginning on 30 March 2017 at 12:00 PM EST and end 3 April 2017 at 12 AM EST
- Data types may include CSV, XLS, XML, SHP, TIF, ZIP files, as well as links to external websites
- Each team's solution should be made available in a ZIP file containing all enabling scripts in a new Catch in the 'User Submission' Net
- **We recommend all participants create user log-ins the prior to the event kick-off**



Teams will be evaluated by a set of criteria to identify the highest potential solutions

Evaluation Criteria

1. **Appropriateness of the solution with respect to real stakeholder needs** (i.e. is this solving a real problem?)
    - *Tip: be sure to take advantage of our assembled mentors and subject matter experts to get feedback during solution design*
2. **Innovation and creativity of the design**
3. **Market potential of the solution**
4. **Technical competence of the solution**
5. **Scalability and application beyond Myanmar**

Format: Overall demo presentation (3min to present solutions followed by 2min Q&A with judges)

Desired Outcomes of Solution

- Open-source, user-friendly data science applications, algorithms and/or tools that allow users to identify where to build small-scale solar and micro-grids in Burma
- The solution must have great data visualization and be accessible to non-technical users
- The underlying approach to the tool or application should be scalable, and may be applied to other countries and data sets

Thank You to All of Our Partners and Sponsors to This Event!

Organizers, Partners & Sponsors

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MYANMAR INNOVATION LAB

MapBox

POWERHOUSE

Appendix

Why Myanmar (Burma)?

Potential Indicators

Other Resources

Myanmar (Burma), where only 30% of people are connected to electricity, has been selected as the focus for the Challenge and the use cases

Myanmar Key Facts and Figures

Sovereign nation in Southeast Asia boarded by Bangladesh, India, China, Laos and Thailand

Formerly known as Burma, Myanmar was part of the British Empire from 1824-1948

Myanmar became an independent state in 1948, however was ruled by a military dictatorship from 1962 until 2016

Member of the Association of Southeast Asian Nations (ASEAN)

Population of 51 million and GDP of USD $61B (2013) – GDP per capita of $1,183 (2013)

Capital is Naypyidaw and largest city is Yangon (formerly Rangoon)

NOTE: Please keep in mind throughout the Challenge that while the use cases are focused on Myanmar, we are seeking creative solutions that can be scaled to other countries

Given the low electricity access rate, Myanmar is seeking to connect its population with affordable, reliable and clean energy

Summary

- **Myanmar currently has one of the lowest electrification rates in the world**. Over 60 percent of households lack electricity, and 84 percent of the rural population have no electricity connection[1]
- **Lack of electricity access creates economic and social hardship, perpetuating poverty, and stalling development** – increasing energy access is seen as a key enabler for broader economic growth
- **Myanmar's government developed a National Electrification Plan calling for universal electricity access by 2030**, however no intermediate milestones were identified and progress is difficult to measure
- Foreign Direct Investment (FDI) is seen as a key enabler for energy projects, and the **World Wildlife Fund has estimated the cost of modernizing Myanmar's grid to be ~$65-80B USD over the next 30yrs**[2]
- **Previous energy investments have been heavy on coal and hydro**, but due to environmental concerns the Government of Myanmar has put is a moratorium on these projects while impact assessments are completed
- The **Ministry of Energy and Electricity** (MOEE) is the government entity responsible for electrification, while the **Ministry of Agriculture, Livestock and Irrigation's Department of Rural Development** is responsible for rural electrification – both are important stakeholders in rural electrification projects
- **Demand for electricity consumption in Myanmar could double over the next four years** according to the Asian Development Bank (ADB) and government officials

1) http://www.worldbank.org/en/news/feature/2015/09/16/electricity-to-transform-rural-myanmar
2) Alternative vision for Myanmar's power sector: Towards full renewable electricity by 2050, WWF, 2016.

Participants are encouraged to form creative hypotheses and test solutions against the use cases – here are a few to get started

Potential Energy Access Indicators and Hypotheses

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- **Where is the cost of diesel highest?** Diesel generators are often used for electricity in areas not connected to the formal grid, driving the cost of diesel fuel to upwards of 3-4x above the cost of elsewhere.
- **Which areas are hard to reach?** Places where state sponsored electricity can't easily extend their network, such as islands or where the road networks are poor, often have greater energy access challenges.
- **Where do the tourists go?** Tourist areas have high demand for reliable energy (hotels, etc.) and a generally higher ability to pay, making them potentially good candidates for commercial projects.
- **Where are the Small and Medium Enterprises (SMEs) in key industries?** SME businesses in areas like fishing, lumber or healthcare have specific and important energy needs (e.g., cold storage or where variable power supplies would create big problems).
- **Where are minority political parties in power?** Government in these areas tend to show they can be effective at govern and improving livelihoods for their constituents, potentially making these areas prime for development.

Participants are also welcome to leverage external developer tools, such as the Mapbox API, to build visualization maps and applications

Accessing and Using Mapbox

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To use Mapbox, start by setting up an access token: it's a short code that lets you use your Mapbox account's capabilities. You can use the same access token with Mapbox's interactive mapping libraries, Python and JavaScript SDKs, and even directly against REST APIs. You can create and manage your access tokens in Mapbox Studio.