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GridLAB-D Open Workspace (GLOW) Project Update

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GLOW Overview

GridLAB-D Open Workspace (GLOW) is a project to deliver a web-based graphical user interface for GridLAB-D. The open-source user interface aims to augment GridLAB-D in a more intuitive, user friendly manner, contributing to wider use of the simulation technology.

Hitachi aims to achieve the intuitiveness of the tool by employing human-centered design approach. The process includes defining requirements for the interface through researching the potential users and designing the interfaces according to the discovered requirements.

Outline

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- Project Overview
- GLOW Alpha – Latest Updates
- Demo/Video
- Related Research Activities
- Future Work

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Project Overview

CEC Distribution Resource Modeling Program

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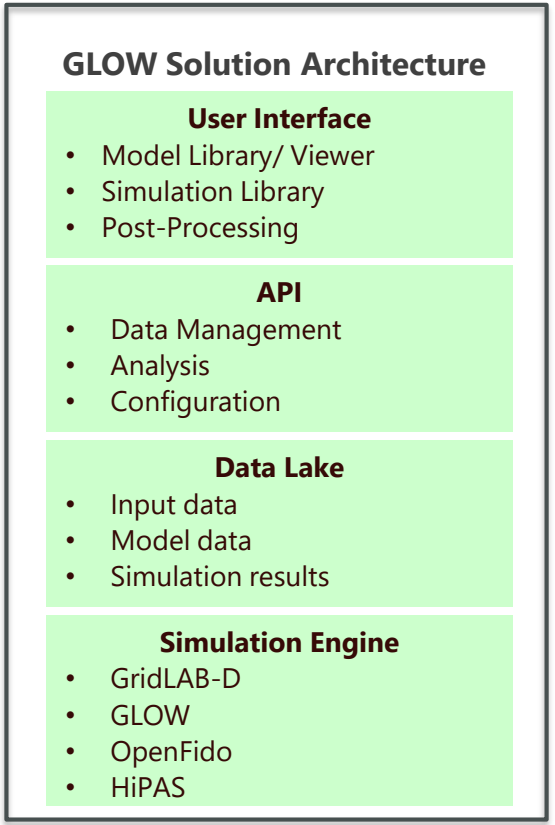
To deliver a set of open-source tools around distribution resource modeling and planning

- **GridLAB-D Open-source Workspace (GLOW)**
  - EPC 17-043 2018-2023
  - General user interface for simulation use cases
    - i.e., Power Flow, ICA
  - **GLOW is primary focus of this presentation**
- High-Performance Agent-based Simulation (**HiPAS)**
  - EPC 17-046 2018-2023
  - High-performance simulation in GridLAB-D
- Open Framework for Integrated Data Operations (**OpenFIDO)**
  - EPC 17-047 2018-2022
  - Data conversion from other tools, e.g. CYME



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Task 4.1: Alpha test – Function test with invited Test Masters

September 2020 – September 2021

- ☑ Alpha test plan
- ☑ GLOW Alpha version release
- ☑ Step-by-step instruction
- ☑ Demo video
- ☑ Test files
- ☑ Monthly meeting and update
- ☑ Quick guide document
- ❑ Manual
- ❑ Additional use cases
- ❑ OpenFido integration
- ❑ Beta Test Plan
- ❑ Notification for Beta Test

Progress

Currently on target to meet GLOW development goals for Beta Version for Sep 2021

Task 4.2 : Beta Test – Usability test with technical society

Sep 2021 – Sep 2022, Scalability and robustness enhancement

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GLOW Alpha Test – Latest Updates

Alpha Test Summary

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- Environment
  - AWS: A staging environment, similar to production environment.
- Purpose
  - Identify issues/bugs and validate functional and non-functional requirements.
- **Updates since Sep 2020**
  - 4 new releases
    - 11.30.20, 12.30.20, 02.01.21, 03.01.21
  - 12 test masters from 4 organizations
    - CEC, CPUC, Sunrun, Kevala Analytics
  - 13 meetings, mostly in groups

Test Master Feedbacks

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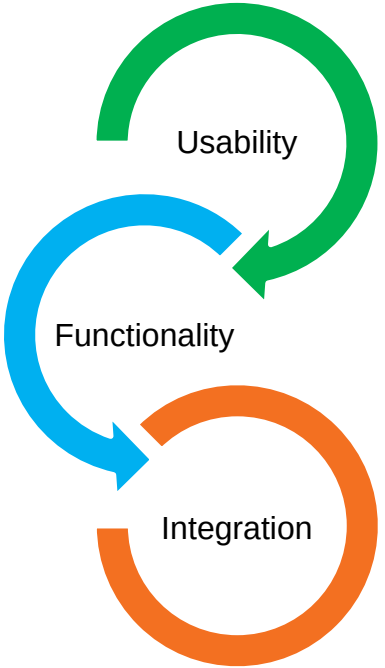
- **Implemented**
  - Download the simulation result in post-processing
  - More information in post-processing chart (e.g., units, labels, object name).
  - Users' manuals
  - User interface improvement (e.g., redundancy in Home page, Viewer, etc.)
  - Time series simulation and charts for the power flow
  - Selection of Reference for Distance

- **Feedbacks with Work in Progress**
  - Need to improve a way to create a model from scratch
  - Preloaded Datasets:
    - Utility grid models with typical conditions
    - Utility grid models of equipment that could be used as basis of initial modeling
    - TMY weather conditions
  - Additional use case (e.g., grid resilience and electrification)
    - Building and transportation electrification
    - Impact on interconnection when charging a car
  - Tracing from any node to the substation

- **Future works**
  - Data transfer capabilities import/export to and from other applications
  - Include a wide range of post-processing tools.



Integration function is mostly applicable to enterprise user and not included in the scope of the current project.

Future works

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- Alpha Test
  - More guidance from industry – **Need utility test masters and test feeders**
  - **Want to set up 24/7 run on utility feeders for system robustness test**

- Beta Release (Sep 2021)
  - More use cases - Grid resilience, electrification of building and EV, tariff evaluation
  - Optimized computational performance for more users
  - Integration with OpenFIDO and HiPAS (available after Sep)

- Beta Test
  - Open to technical society – universities, utilities and research entities
  - Free individual user account, personal evaluation only
  - No sensitive data

Demo/Video

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Related Research Activities

Hosting Capacity Analysis – Updates since Sep 2020

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- Improvement
  - ICA for all system nodes
  - ICA for both load type and generation type (load type is useful for EV impact analysis)
  - More benchmarks with industry tools (CYME, OpenDSS)
  - Improved computational efficiency
    - For IEEE123 feeder system, **~32 mins → ~ 3 min**
  - Better UI to support various ICA settings and result processing
- Next-step
  - More tests on utility feeder – **Need industry feeders**
  - Evaluate the impacts of load dynamics on ICA
  - More templates for visualization and post-processing (e.g. GLOW/Viewer, GLOW/Post-processing)
  - Continue to optimize performance with HiPAS

New Use Case: Grid Resiliency

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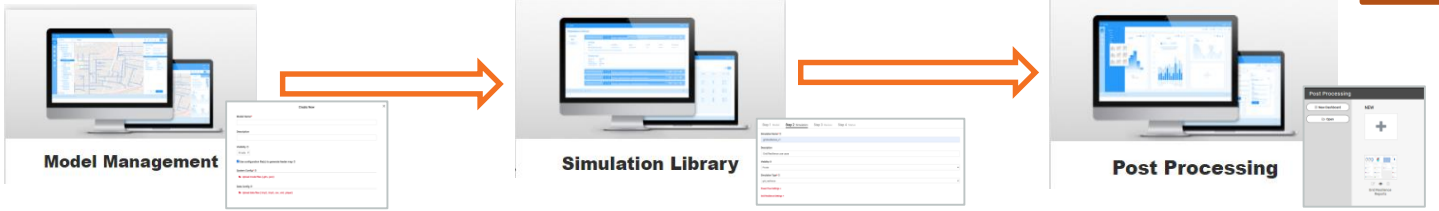
- **Objectives**
  - Incorporate resilience planning into current GLOW framework
  - Anticipate the vulnerabilities of grid assets, e.g. pole component, under extreme weather conditions
  - Qualitative evaluation of grid resilience measures including restoration plans or grid hardening options (under development)
- **Methodology**:
  - GridLAB-D time-series power flow simulation with weather profile
  - Pole vulnerability model

GLOW Implementation

Industry feedback



- Upload feeder asset model
- Upload Weather data (TMY or player file)
- Validate model

- Create new grid resilience simulation
- Change simulation parameters
- Change weather scenarios by uploading new weather data

- Generate grid resilience report (template-based)
- Customize simulation output plotting

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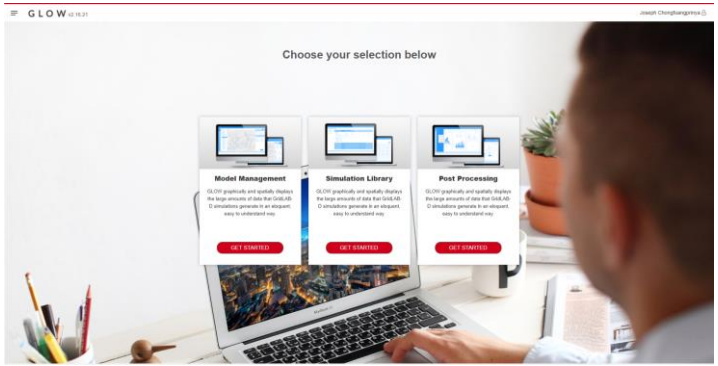
Summary

Summary

- **Alpha test** ongoing (Sep 2020 – Sep 2021)
  - Welcome utility test masters – 1-2 hours each month
  - Prefer industry test feeders – any format

- **Beta test** - Usability test with technical society
  - *Sep 2021 – Sep 2022, Scalability and robustness enhancement*
  - Open to technical society
  - Beta release and test plan available in Sep 2021
  - Early bird enrollment welcome!



Thank You

- California Energy Commission
- California Public Utility Commission
- South California Edison
- Pacific Gas & Electric
- Sunrun
- Kevala Analytics
- SLAC
- Gridworks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