

Statement of Project Objectives

Spokane Edo LLC (Edo)

Spokane Connected Communities Project: advancing a new and scalable business model which demonstrates a mutually beneficial framework for the grid, the people it serves, and the built environment

A. Project Objectives:

The goal of the project is to demonstrate a scalable business model which meets regional and local grid needs. The needs are met through a diverse mix of grid interactive efficient buildings (GEBs) providing energy efficiency (EE) opportunities and hosting distributed energy resources (DERs) which can deliver grid services (GS). The project will test a business model which includes a variety of incentives and ownership/control models designed to aggregate a wide range of participants into a grid resource. The project applies an equity lens to customer recruitment. By prioritizing customers that are marginalized or low income and which have a high usage profile, we hope to gain insights into how the benefits of a connected community can advantage low-income residential customers and small businesses while simultaneously contributing to our project's quantitative goals. The project will demonstrate that buildings play a unique role in decarbonization, resiliency and equity. The project will demonstrate scalable solutions that will reduce emissions between 10% and 20% through energy efficiency improvements, reduction/shifting of peak load, and strategic deployment of DERs. Resiliency benefits will be demonstrated through the ability to reliably reduce and shift load by calling on the project's flexibility assets without adverse effects to occupant comfort at times of need, such as future "heat domes". Finally, the goal of the project is to demonstrate scalable solutions for 50-75 residential/multi-tenant customers and 25-50 commercial customers that will lower electricity bills between 10% and 20% and deliver operational improvements to occupants of commercial, industrial, and residential (including low-income) buildings. The project team will develop a playbook describing how utilities can adopt these demonstrated solutions to meet their specific needs.

B. Technical Scope Summary

The proposed five-year project is designed to develop a scalable business model which meets regional and local grid needs through a diverse mix of GEBs. The research project has three distinct phases: (1) a data-driven planning and participant outreach phase where packages will be developed for each customer class (residential, small commercial, large commercial, and industrial) and the scheduling and dispatch communications platform, (2) a hardware installation phase where equipment packages will be installed on customer sites, evaluate the EE and GS performance and fine tune packages to achieve desired scalability goals, and (3) a scaling phase where the project team will write playbooks and work with project partners to develop utility programs from the Connected Communities pilot.

The planning and participant outreach phase will be driven by detailed model simulations of customer load profiles for the 8 feeders associated with the 3rd and Hatch substation. These automated meter infrastructure (AMI) data based simulations will focus on understanding customer load profiles (residential, small commercial and large commercial), which will be used to create equipment packages that have the largest potential to save customers energy, and enable them to provide the demand flexibility (DF) to the grid during times of peak load on the substation. Equipment packages will be tailored based on our ability to communicate with and control equipment for each customer class, and will range from utilizing the BACnet protocol for large commercial customers, to connecting directly to RTUs (via connected thermostats) and other equipment for small commercial customers, to communicating with smart thermostats and water heaters (via CTA-2045 controllers) for residential customers. The modeling exercise will produce three deliverables: (1) target numbers of participants for each customer class (residential, small commercial and large commercial) to achieve sufficient participation to achieve the project's flexibility, energy savings and GHG reduction goals, (2) tailored equipment package options for each customer class to optimize their energy savings and demand flexibility, and (3) data-driven valuations for each customer class to inform pilot rates/incentives to entice customer participation.

The second phase of the project will focus on installing hardware at customer locations (in two cohorts), scheduling and dispatching participant load, and refining offerings based on customer feedback. During the second year, hardware packages will be installed in Project partner's Research and Development (R&D) lab and with the first cohort of participants, including 2-6 residential, 2-5 small commercial and 2-4 large commercial customers. The intent of this phase is to test hardware first in a lab setting and then in the field, learn from our experience installing equipment at customer sites, and refine our approach to make installations quicker, cheaper and less invasive. The first cohort of installations will occur in parallel to finalizing our participant outreach efforts to reach the project's EE, DF and GHG reduction targets. The team will integrate lessons learned and scale our tested solutions to complete installations for the second cohort of customers which represents all remaining participants. The team will schedule and dispatch participant energy use to achieve project EE, DF and GHG reduction targets, engage with participants (through surveys, etc.) and to gauge customer satisfaction with different equipment packages.

The final stage of the project will focus on integrating lessons learned from the pilot and market outreach. Based on customer feedback, pilot rates/incentives used to entice participation, and the contribution that each customer segment made to reach EE, DF, and GHG targets, the team will identify scalable GEB offerings for programs with Project partner's customers and other utilities. This will include evaluating options for future DF and EE programs, and approach for engaging regulators to approve new rates and/or programs. The lessons learned to scale the integration packages, decrease set up time, and overcome challenges will be included in the Spokane Connected Communities Playbook. The Playbook outline will include: key findings; how to successfully recruit customers; design of technology solutions and incentives in package offerings; outcomes of implementing packages, including benefits to owners/occupants and the community; flexibility and resiliency provided by the packages; how packages were adjusted for

participants and grid optimization; open-source information; outputs of grid services simulations; overcoming market and regulatory barriers; and utility insights.

Expected outcomes: 75 – 125 participants (50-75 residential and 25-50 commercial) engaged and retained in the program; cost-effective grid flexibility delivered between 1 Mega Watt (MW) and 2.25 MW; 440-900 Mega Watt Hour (MWh) reduction of energy consumption annually; and 320,000 – 650,000 pounds (lb) carbon dioxide equivalent (CO₂e) reduced annually; Connected Communities Playbook will be created and disseminated.

C. Tasks to Be Performed

Budget Period 1

Task 1: Strategic Planning

The project team will develop plans for key project objectives and deliverables.

Subtask 1.1 Hold a two-day project kick-off workshop;

Subtask 1.2 Develop Customer Engagement Plan

Milestone 1.1 Deliver Customer Engagement Plan

Subtask 1.3 Develop DER and Load Evaluation Plan

Milestone 1.2 Deliver DER and Load Evaluation Plan

Subtask 1.4 Develop plan for Building Load Flexibility Packages

Milestone 1.3 Deliver Building Load Flexibility Packages Plan

Subtask 1.5 Develop Communication & Data Plan

Milestone 1.4 Deliver Communication and Data Plan

Subtask 1.6 Develop Grid Issue Use Case Plan

Milestone 1.5 Deliver Grid Issue Use Case Plan

Subtask 1.7 Develop Energy Efficiency Use Case Plan

Milestone 1.6 Deliver Energy Efficiency Use Case Plan

Subtask 1.8 PNW CCAC/Stakeholder Communication Plan

Milestone 1.7 Deliver PNW CCAC / Stakeholder Communication Plan

Subtask 1.9 Management and Coordination with Project Partners and Department of Energy (DOE)

Milestone 1.8 Coordinate quarterly, or as needed, review meetings with DOE.

Task 2: Connected Communities Cohort and National Coordinator Collaboration

The project team will participate in the novel Connected Communities program by collaborating with the Connected Communities Awardee Cohort (Cohort) and the National Coordinator (LBNL). Participation will include virtual meetings, summits, the Building Technologies Office (BTO) Peer review, and collaboration on R&D and external stakeholder engagement as outlined in the milestones below. This task spans Budget Periods 1 – 5.

Milestone 2.1 Attend the Connected Communities Funding Opportunity Announcement (FOA) Kickoff Meeting. Attend and provide a brief presentation on the project as well as network with other awardees and collaborate with the National Coordinator.

Milestone 2.2 Attend annual CC cohort summit to share project progress, lessons learned, best practices and collaborate on common challenges. The time and location of the annual summit will be coordinated with BTO's Peer Review when applicable.

Milestone 2.3 Attend BTO Peer Review. Peer Review of each project typically occurs once every 2-3 years, and will occur at least once over the duration of the project. Peer Review will include a presentation on project progress, challenges, and market transformation activities.

Milestone 2.4 Attend and present project progress in a CC Cohort Meeting of one to two hours each per quarter for Cohort feedback and guidance. The agenda, format and timing for each call will be provided at least one month prior to the virtual meeting.

Milestone 2.5 Collaborate with cohort and National Coordinator on select cross-cutting R&D research topics. Collaboration to include attending cohort virtual meetings (assuming a one (1) hour meeting per month on a given R&D topic), providing input on project needs and conditions for collaborative solution development across the cohort, and to inform the National Coordinator's development of R&D and resources. It is anticipated that a project will be interested in participating in 2-3 cross-cutting R&D topics per year of the award.

Milestone 2.6 Collaborate with the National Coordinator on select project-specific technical assistance topics. Provide project related details to the National Coordinator and collaborate on technical assistance topic area.

Milestone 2.7 Coordinate with the National Coordinator on external stakeholder outreach. Will include providing content to the National Coordinator to support the development of case studies, newsletter stories, and providing deliverable resources for hosting on the Connected Communities website. Coordinate with the National Coordinator on

project market transformation plan tasks along with efforts for national stakeholder engagement by LBNL.

Milestone 2.8 Complete Measurement and Verification (M&V) plan.

Milestone 2.9 Complete preliminary M&V report.

Milestone 2.10 Complete final M&V report.

Milestone 2.11 Deliver annual M&V report of project impacts.

Task 3: Participant data gathering

The project team will analyze the existing customer base and their load profiles in the target neighborhoods served by the 3rd and Hatch substation, and conduct customer surveys and behavioral research to understand customer motivations.

Subtask 3.1 Complete market analysis to determine existing building stock characteristics in the neighborhoods served by the 3rd and Hatch substation.

Milestone 3.1 Market research report about potential participant characteristics completed.

Subtask 3.2 Develop a human subject testing plan for surveys and behavioral research, and work with an Institutional Review Board (IRB) to get approval.

Milestone 3.2 Complete IRB approval for surveys and behavioral research before fielding surveys.

Subtask 3.3 Conduct initial customer surveys in target neighborhoods (100-200 residential, 25-50 small commercial and 10-25 large commercial) to identify customer-side pain points to further refine customer recruitment retention materials.

Milestone 3.3 Conduct customer sentiment survey and receive a minimum number of responses from each customer type (100 residential, 25 small commercial, and 10 large commercial).

Subtask 3.4 Design and conduct behavioral economics and ethnographic research to shape incentive packages with equity lens per customer class.

Milestone 3.4 Deliver report to DOE on research findings, and proposed incentive packages.

Task 4: Modeling & simulation

The project team will use customer load profiles to develop solution packages, and DER/EE measures, and inform customer recruitment strategy and prototypical rate/incentive design.

Subtask 4.1 Identify appropriate packages of DER and EE measures (packages will be designed to maximize customer and grid benefits by building type, location and estimated duration and time of grid services).

Milestone 4.1 Deliver a plan specifying the equipment package(s) for residential, small commercial, and large commercial customers.

Subtask 4.2 Define prototypical rate/incentive design at the start of the project for use during the field demonstrations.

Subtask 4.3 Create building-to-grid and grid feeder models, deep analysis of customer load profiles using cluster analysis to determine customer types, solution packages and incentive design.

Subtask 4.4 Run simulation to determine which scenarios will meet the project objectives; review of solution package design.

Milestone 4.2 Deliver a plan for recruiting 50-75 residential customers, 25-50 commercial customers, and describe how this will meet project objectives for proposed flexibility (1-2.25 MW), EE savings (440-900 MWh), and GHG emissions reductions (320,000 – 650,000 lb CO₂e).

Task 5: Technology adaptation and development

The project team will develop a software platform that connects the equipment in buildings to grid resources, and create solutions packages.

Subtask 5.1 Design platform for solution packages, communications, simulation, hardware in the loop (HIL) testing and laminar coordination.

Subtask 5.2 Design open-source software to enable OpenDSO and VOLTTRON™ to interface to coordinate grid services across multiple buildings; develop automated solutions to engage residential air conditioners, heat pumps, and hot water (HW) heaters in providing grid services and to integrate battery storage devices in providing grid services.

Subtask 5.3 Refine pre-existing solutions for commercial buildings (both with and without BAS) to extract demand flexibility from various DERs.

Subtask 5.4 Adapt deployment platform for small commercial buildings without BASs (the platform will coordinate grid services using connected thermostats, HW controllers, battery storage devices and connected lighting systems at a minimum).

Subtask 5.5 Develop a suitable platform/gateway solution to coordinate DERs in residential buildings.

Subtask 5.6 Conduct tests in selected buildings ensuring that all hardware, software & communication systems work as designed and the team is ready for widespread deployment of the solution and M&V plan.

Subtask 5.7 Adapt and implement previously developed building load flexibility solutions (e.g., Intelligent Load Control [ILC]) and EE solutions (e.g., automated fault detection and diagnostic [AFDD] and automated identification of Re-tuning/retro-commissioning [AIRCx] measures).

Subtask 5.8 Test solution packages and grid interaction with simulation and HIL.

Milestone 5.1 Deliver report on the software developed and tests of solution packages.

Task 6: Cybersecurity & data privacy

The project team will conduct a cybersecurity threat assessment, and develop a cybersecurity plan. This task spans Budget Periods 1 – 5.

Subtask 6.1 Develop cybersecurity and data privacy plans.

Milestone 6.1 Deliver cybersecurity and privacy plans.

Subtask 6.2 Conduct annual cybersecurity assessment, and update plan if needed.

Milestone 6.2 Deliver annual cybersecurity assessment report.

Go/No Go Decision 1: Recipient will submit a preliminary design on how it intends to deliver demand flexibility and EE measures for residential and commercial customers and compare them to the proposed flexibility (1-2.25 MW), EE savings (440-900 MWh), and GHG emissions reductions (320,000 – 650,000 lb CO₂e). The plan will include how equity is considered in the selection of the customers, how it addresses DOE and project objectives, how technology will be used to coordinate DERs and EEs, and the completion of the M&V plan and preliminary cybersecurity and data privacy plan. The team will complete Institutional Review Board (IRB) review prior to conducting surveys and behavioral research.

Budget period 2

Task 7: Recruitment and retention

The project team will recruit customers, conduct building audits, and adapt equipment packages, create messaging, and engage media. This task spans Budget Periods 2 and 3, where

the team will develop messaging and recruit the first cohort of participants in BP2, and continue to recruit the remaining participants in BP3.

Subtask 7.1 Create messaging tailored to different participant types.

Subtask 7.2 Engage media to build general awareness of the program and opportunities for participation.

Subtask 7.3 Execute messaging, conduct direct customer engagement via email, mailings, and events.

Subtask 7.4 Conduct on-site building audits to assess facilities and applicability of DER/incentive packages.

Subtask 7.5 Adapt packages (technology and incentives) to building characteristic audit findings.

Subtask 7.6 Contract customers.

Subtask 7.7 Conduct customer surveys prior to installation, immediately following installation, and one month after installation.

Milestone 7.1 Recruitment campaign launched to recruit a minimum of 75-125 participants.

Task 8: Implementation of EE Measures and Grid Services

The project team will install equipment packages with the first cohort of customers.

Subtask 8.1 Conduct hardware in the loop (HIL) tests of equipment packages and communication hardware in Project partner's R&D Lab.

Milestone 8.1 Complete hardware in the loop (HIL) tests of equipment packages and communication hardware in Project partner's R&D Lab.

Subtask 8.2 Installation of communication equipment (gateway and data acquisition devices) in first cohort of participants (2-6 residential, 2-5 small commercial, 2-4 large commercial);

Subtask 8.3 Deployment of EE measures related to operational improvements (smart thermostats, connected lighting controls, heat pumps) and grid services (VOLTTRON™, ILC, TCC, AIRCx and AFDD applications) in first cohort of participants.

Subtask 8.4 Installation of DERs in first cohort of residential, commercial, and industrial participants.

Subtask 8.5 Confirmation that hardware, software, and communications systems work with the first cohort of participants.

Milestone 8.2 Completion of initial deployment of EE operational measures in residential and commercial buildings (2-6 residential, 2-5 small commercial, 2-4 large commercial).

Milestone 8.3 Completion of installation of all hardware, software and communication systems with the first cohort of participants.

Task 9: Sharing of Lessons Learned

Project team will host regional meetings and present findings, write the Connected Communities Playbook, and publish behavioral research. This task spans Budget Periods 2 – 5.

Subtask 9.1 Host regular PNW CCAC meetings and create a Playbook Working Group.

Milestone 9.1 Create Connected Communities Playbook Working Group.

Subtask 9.2 Sponsor and present findings at the Western WA Clean Cities Coalition annual meeting.

Subtask 9.3 Conduct and publish behavioral and sentiment research relating to incentive results.

Subtask 9.4 Write Connected Communities Playbook.

Milestone 9.2 Deliver outline of Connected Communities Playbook.

Milestone 9.3 Deliver draft Connected Communities Playbook.

Milestone 9.4 Deliver final Connected Communities Playbook.

Go/No Go Decision 2: Completion of recruitment of buildings and DERs. Recipient will show DOE that the project team has commitment for at least 1 MW of load flexibility; have the potential for at least 440 MWh energy savings and 320,000 CO₂e reduced annually; the mix of buildings includes single- & multi-family homes and small & large commercial buildings, new & existing; at least 15% of the customers will be low- and medium-income; at least 4 types of DERs/controllable loads are installed. Complete installation of EE operational measures in first cohort of residential and commercial buildings (at least 2 residential, 2 small commercial, and 2 large commercial).

Budget period 3

Task 10: Retention

The project team will conduct annual surveys, and integrate customer feedback. This task spans Budget Periods 3 – 5.

Subtask 10.1 Conduct annual customer surveys.

Subtask 10.2 Respond to customer queries.

Subtask 10.3 Adjust program in alignment with feedback.

Milestone 10.1 Deliver annual report summarizing customer feedback, and describe any adjustment to program offerings based on feedback.

Milestone 10.2 Conduct and publish behavioral & sentiment research relating to incentive results.

Milestone 10.3 Project retains a minimum of 75 participants.

Task 11: Optimization of EE Measures and GSs

The project team will complete the installation of EE and DERs for all participants, optimize EE and DER assets, and distribute incentives to participants.

Subtask 11.1 Complete installation of EE measures (smart thermostats, connected lighting controls, heat pumps), and communications equipment (gateway and data acquisition devices).

Milestone 11.1 EE measures installed in all buildings.

Subtask 11.2 Optimize EE measures to provide energy savings and grid services (VOLTTRON™, ILC, TCC, AIRCx and AFDD applications).

Milestone 11.2 Deliver annual report on continued monitoring and optimization of installed EE measures.

Subtask 11.3 Complete additional installations of DERs in all residential, commercial, and industrial buildings.

Milestone 11.3 Complete installation and integration of additional DERs for all participants.

Subtask 11.4 Confirm that all hardware, software, and communications systems work.

Subtask 11.5 Engage DERs to provide grid services during winter, shoulder, and summer seasons.

Milestone 11.4 Completion of initial grid services tests.

Subtask 11.6 Distribution of financial incentives to participants.

Subtask 11.7 Develop prototypical rate/incentive design used to engage DERs and building systems.

Subtask 11.8 Develop methods to facilitate access to data, operational dashboards, and results vs target values for each metric developed around solution packages.

Milestone 11.5 Complete data dashboards.

Subtask 11.9 The team will recommend potential long-term products, programs, customer offerings, and rates for customers as well as test/simulation plans to validate.

Milestone 11.6 Deliver a preliminary report with recommendations for potential long-term activities, based on the performance of equipment packages in the field.

Milestone 11.7 Deliver a final report with recommendations for potential long-term activities, based on the performance of equipment packages in the field.

Subtask 11.10 Deploy grid service optimization algorithms for laminar coordination simulation and testing.

Milestone 11.8 Deliver report on performance of laminar coordination simulation and testing.

Go/No Go Decision 3: Recipient will compile preliminary results from GS tests from all buildings, demonstrate how they compare with the minimum project targets (1 MW of load flexibility; have the potential for 440MWh energy savings and 320,000 lb CO₂e reduced annually) and suggest any course correction, if needed. Recipient will also compile preliminary savings from operational EE measures. Playbook draft will be started and shared with DOE.

Budget period 4

Several subtasks and milestones from Task 2 (Connected Communities Cohort and National Coordinator Collaboration), Task 9 (Sharing of Lessons Learned), Task 10 (Retention), Task 11 (Optimization of EE Measures and GSs), and Task 12 (Sharing of Lessons Learned) will be

completed during Budget Period 4.

Go/No Go Decision 4: Recipient will compile results from grid services tests and EE measures from all buildings and show that they are within 10% of the project goals.

Budget period 5

Several subtasks and milestones from Task 2 (Connected Communities Cohort and National Coordinator Collaboration), Task 9 (Sharing of Lessons Learned), Task 10 (Retention), Task 11 (Optimization of EE Measures and GSs), and Task 12 (Sharing of Lessons Learned) will be completed during Budget Period 5.

End of Project Goal: The project will complete a Connected Communities Playbook that will detail the business model and activities needed to efficiently deploy and manage packages of data sensors/control devices, EE measures, and DERs.

D. Project Management and Reporting

In Edo, the Connected Communities Project Manager (CC PM) will oversee project execution and delivery of the products. The CC PM is guided by Edo's Managing Director (MD). The CC PM: works with the project partners to develop the project and risk management plans; acts in the coordinating role to ensure scope tasks are delivered on time and on budget; schedules regular meetings with the project team to assess the project status and needs; and is the primary contact, coordinating all interactions and communication with the project team and the PNW CCAC. Communication will happen at monthly (project team) and quarterly (DOE, PNW CCAC and NC) intervals and via email and phone calls, in between meetings. Edo's MD will join the CC PM in the project kickoff meeting and the critical project review meetings. Edo's General Counsel will be responsible for all contractual matters, while Edo's Project Accounting Manager will be responsible for financial and administrative matters.

The CC PM will coordinate all the technical work conducted by Edo and partner organizations as well as the Final Technical Report due within 90 days of the end of the project. Each task will have a task manager (TM) who will report to the CC PM. The TM is responsible for managing all the work and products in the task. Any individual task issues will be managed by the TM, PM and Edo's MD. The TM will participate in periodic meeting with the DOE and in PNW CCAC meetings. Project changes may be required as the project is implemented. When changes are required, project management plans will be updated, and the TM will communicate the plans to the team. The changes, and what necessitated the changes, will be recorded in quarterly and annual reports.

Data management and IP: Our CC team will work with customer AMI data that will be anonymized and in some cases aggregated to protect personally identifiable information (PII).

Our utility partner will scrub PII before making data available to the rest of the team for analyses. Any published background data and analysis in reports and research papers that contain customer load profiles will be presented in an aggregated and anonymized form. Edo will also be extending a few existing and/or prototyped software and systems during this research project. This includes, but may not be limited to, the software that Edo has developed to control building equipment and systems with our gateway devices, extending Edo's edge analytics, extending Edo's cloud-based optimization tools that develop optimal control schedules for buildings, and Avista's tools for optimizing distributed assets at the grid operator level. In general, Edo intends to open source as much software as possible but might retain some RCS status where it is central to our commercial IP.

Work Breakdown Structure (WBS)

PROJECT TITLE					Spokane Connected Communities			
Recipient Name					Spokane Edo LLC (dba Edo)			
Project Start Date					Click here to enter a date.			
Project End Date					Click here to enter a date.			
Budget Period #	Task Type	Task #	Subtask #	M or D #	Milestone/Deliverable Description	Planned Project Month START	Planned Project Month END/DUE	
1...10	Select	0...50		0...n 0.0...n	Title text from SOPO	1...120	1...120	
1	BP	0	0	0	Budget Period #1	1	12	
1	T	1	0	0	Strategic Planning	1	60	
1	ST	1	1	0	Holding a two-day project kick-off workshop	1	12	
1	ST	1	2	0	Develop Customer Engagement Plan	1	12	
1	M	1	2	1	Deliver Customer Engagement Plan	1	12	
1	ST	1	3	0	Develop DER and Load Evaluation Plan	1	12	
1	M	1	3	2	Deliver DER and Load Evaluation Plan	1	12	
1	ST	1	4	0	Develop plan for Building Load Flexibility Packages	1	12	
1	M	1	4	3	Deliver Building Load Flexibility Packages Plan	1	12	
1	ST	1	5	0	Develop Communication & Data Plan	1	12	
1	M	1	5	4	Deliver Communication and Data Plan	1	12	
1	ST	1	6	0	Develop Grid Issue Use Case Plan	1	12	
1	M	1	6	5	Deliver Grid Issue Use Case Plan	1	12	
1	ST	1	7	0	Develop Energy Efficiency Use Case Plan	1	12	
1	M	1	7	6	Deliver Energy Efficiency Use Case Plan	1	12	
1	ST	1	8	0	PNW CCAC/Stakeholder Communication Plan	1	12	
1	M	1	8	7	Deliver PNW CCAC / Stakeholder Communication Plan	1	12	
1	ST	1	9	0	Management and Coordination with Project Partners and DOE	1	60	
1	M	1	9	8	Coordinate quarterly and as needed review meetings with DOE	1	60	

1	T	2	0	0	Connected Communities Cohort and National Coordinator Collaboration	1	60
1	M	2	0	1	Attend the Connected Communities Funding Opportunity Announcement (FOA) Kickoff Meeting. Attend and provide a brief presentation on the project as well as network with other awardees and collaborate with the National Coordinator.	1	12
1	M	2	0	2	Attend annual CC cohort summit to share project progress, lessons learned, best practices and collaborate on common challenges. The time and location of the annual summit will be coordinated with BTO's Peer Review when applicable.	1	60
1	M	2	0	3	Attend BTO Peer Review. Peer Review of each project typically occurs once every 2-3 years, and will occur at least once over the duration of the project. Peer Review will include a presentation on project progress, challenges, and market transformation activities.	1	60
1	M	2	0	4	Attend and present project progress in a CC Cohort Meeting of one to two hours each per quarter for Cohort feedback and guidance. The agenda, format and timing for each call will be provided at least one month prior to the virtual meeting.	1	60
1	M	2	0	5	Collaborate with cohort and National Coordinator on select cross-cutting R&D research topics. Collaboration to include attending cohort virtual meetings (assuming a one (1) hour meeting per month on a given R&D topic), providing input on project needs and conditions for collaborative solution development across the cohort, and to inform the National Coordinator's development of R&D and resources. It is anticipated that a project will be interested in participating in 2-3 cross-cutting R&D topics per year of the award.	1	60
1	M	2	0	6	Collaborate with the National Coordinator on select project-specific technical assistance topics. Provide project related details to the National Coordinator and collaborate on technical assistance topic area.	1	60
1	M	2	0	7	Coordinate with the National Coordinator on external stakeholder outreach. Will include providing content to the National Coordinator to support the development of case studies, newsletter stories, and providing deliverable resources for hosting on the Connected Communities website. Coordinate with the National Coordinator on project market transformation plan tasks along with efforts for national stakeholder engagement by LBNL.	1	60
1	M	2	0	8	Complete M&V plan.	12	12
2	M	2	0	9	Complete preliminary M&V report.	18	18

2	M	2	0	10	Complete final M&V report.	24	24
3	M	2	0	11	Deliver annual M&V report.	36	36
4	M	2	0	11	Deliver annual M&V report.	48	48
5	M	2	0	11	Deliver annual M&V report.	60	60
1	T	3	0	0	Participant Data Gathering	3	3
1	ST	3	1	0	Complete market analysis to determine existing building stock characteristics in the neighborhoods served by the 3rd and Hatch substation.	1	12
1	M	3	1	1	Market research report about potential participant characteristics completed.	12	12
1	ST	3	2	0	Conduct an Institutional Review Board (IRB) review of surveys and behavioral research.	6	12
1	M	3	2	2	Complete Institutional Review Board (IRB) review.	12	12
1	ST	3	3	0	Conduct initial customer surveys in target neighborhoods (100-200 residential, 25-50 small commercial and 10-25 large commercial) to identify customer-side pain points to further refine customer recruitment retention materials.	1	12
1	M	3	3	3	Conduct customer sentiment survey and receive a minimum number of responses from each customer type (100 residential, 25 small commercial, and 10 large commercial).	12	12
1	ST	3	4	0	Design and conduct behavioral economics and ethnographic research to shape incentive packages with equity lens per customer class.	1	12
1	M	3	4	4	Deliver report to DOE on research findings, and proposed incentive packages.	12	12
1	T	4	0	0	Modeling and Simulation	1	12
1	ST	4	1	0	Identify appropriate packages of DER and EE measures (packages will be designed to maximize customer and grid benefits by building type, location and estimated duration and time of grid services).	1	12
1	M	4	1	1	Deliver a plan specifying the equipment package(s) for residential, small commercial, and large commercial customers.	12	12
1	ST	4	2	0	Define prototypical rate/incentive design at the start of the project for use during the field demonstrations.	1	12
1	ST	4	3	0	Create building-to-grid and grid feeder models, deep analysis of customer load profiles using cluster analysis to determine customer types, solution packages and incentive design.	1	12

1	ST	4	4	0	Run simulation to determine which scenarios will meet the project objectives; review of solution package design.	1	12
1	M	4	0	2	Deliver a plan for recruiting 50-75 residential customers, 25-50 commercial customers, and describe how this will meet project objectives for proposed flexibility (1-2.25 MW), EE savings (440-900 MWh), and GHG emissions reductions (320,000 – 650,000 lb CO ₂ e).	12	12
1	T	5	0	0	Technology adaptation and development	1	12
1	ST	5	1	0	Design platform for solution packages, communications, simulation, hardware in the loop (HIL) testing and laminar coordination.	1	12
1	ST	5	2	0	Design open-source software to enable OpenDSO and VOLTTRON™ to interface to coordinate grid services across multiple buildings; develop automated solutions to engage residential air conditioners, heat pumps, and hot water (HW) heaters in providing grid services and to integrate battery storage devices in providing grid services.	1	12
1	ST	5	3	0	Refine pre-existing solutions for commercial buildings (both with and without BAS) to extract demand flexibility from various DERs.	1	12
1	ST	5	4	0	Adapt deployment platform for small commercial buildings without BASs (the platform will coordinate grid services using connected thermostats, HW controllers, battery storage devices and connected lighting systems at a minimum).	1	12
1	ST	5	5	0	Develop a suitable platform/gateway solution to coordinate DERs in residential buildings.	1	12
1	ST	5	6	0	Conduct tests in selected buildings ensuring that all hardware, software & communication systems work as designed and the team is ready for widespread deployment of the solution and M&V plan.	1	24
1	ST	5	7	0	Adapt and implement previously developed building load flexibility solutions (e.g., Intelligent Load Control [ILC]) and EE solutions (e.g., automated fault detection and diagnostic [AFDD] and automated identification of Re-tuning/retro-commissioning [AIRCx] measures).	1	18
1	ST	5	8	0	Test solution packages and grid interaction with simulation and HIL.	1	21
1	M	5	0	1	Deliver report on the software developed and tests of solution packages.	12	12
1	T	6	0	0	Cybersecurity & data privacy	1	60
1	ST	6	1	0	Develop cybersecurity and data privacy plans.	1	12
1	M	6	1	1	Deliver cybersecurity and privacy plans.	12	12
2	ST	6	2	0	Conduct annual cybersecurity assessment, and update plan if needed.	13	60
2	M	6	2	2	Deliver annual cybersecurity assessment report.	24	24

3	M	6	2	2	Deliver annual cybersecurity assessment report.	36	36
4	M	6	2	2	Deliver annual cybersecurity assessment report.	48	48
5	M	6	2	2	Deliver annual cybersecurity assessment report.	60	60
1	G/NG	0	0	0	Recipient will submit a preliminary design on how it intends to deliver demand flexibility and EE measures for residential and commercial customers and compare them to the proposed flexibility (1-2.25 MW), EE savings (440-900 MWh), and GHG emissions reductions (320,000 – 650,000 lb CO ₂ e). The plan will include how equity is considered in the selection of the customers, how it addresses DOE and project objectives, how technology will be used to coordinate DERs and EEs, and the completion of the M&V plan and preliminary cybersecurity and data privacy plan. The team will complete Institutional Review Board (IRB) review prior to conducting surveys and behavioral research.	12	12
2	T	7	0	0	Recruitment and retention	13	36
2	ST	7	1	0	Create messaging tailored to different participant types.	13	24
2	ST	7	2	0	Engage media to build general awareness of the program and opportunities for participation.	13	36
2	ST	7	3	0	Execute messaging, conduct direct customer engagement via email, mailings, and events.	13	36
2	ST	7	4	0	Conduct on-site building audits to assess facilities and applicability of DER/incentive packages.	13	36
2	ST	7	5	0	Adapt packages (technology and incentives) to building characteristic audit findings.	13	36
2	ST	7	6	0	Contract customers.	18	36
2	ST	7	7	0	Conduct customer surveys prior to installation, immediately following installation, and one month after installation.	18	36
2	M	7	0	1	Recruitment campaign launched to recruit a minimum of 75-125 participants.	24	24
2	T	8	0	0	Implementation of EE Measures and Grid Services	13	36
2	ST	8	1	0	Conduct hardware in the loop (HIL) tests of equipment packages and communication hardware in Project partner's R&D Lab.	13	24
2	M	8	0	1	Complete hardware in the loop (HIL) tests of equipment packages and communication hardware in Project partner's R&D Lab.	22	22
2	ST	8	2	0	Installation of communication equipment (gateway and data acquisition devices) in first cohort of participants (2-6 residential, 2-5 small commercial, 2-4 large commercial);	13	24

2	ST	8	3	0	Deployment of EE measures related to operational improvements (smart thermostats, connected lighting controls, heat pumps) and grid services (VOLTTRON™, ILC, TCC, AIRCx and AFDD applications) in first cohort of participants.	18	24
2	ST	8	4	0	Installation of DERs in first cohort of residential, commercial, and industrial participants.	18	24
2	ST	8	5	0	Confirmation that hardware, software, and communications systems work with the first cohort of participants.	18	24
2	M	8	0	2	Completion of initial deployment of EE operational measures in residential and commercial buildings (2-6 residential, 2-5 small commercial, 2-4 large commercial).	24	24
2	M	8	0	3	Completion of installation of all hardware, software and communication systems with the first cohort of participants.	24	24
2	T	9	0	0	Sharing of Lessons Learned	13	60
2	ST	9	1	0	Host regular PNW CCAC meetings and create a Playbook Working Group.	13	60
2	M	9	1	1	Create Connected Communities Playbook Working Group.	24	24
2	ST	9	2	0	Sponsor and present findings at the Western WA Clean Cities Coalition annual meeting.	13	60
2	ST	9	3	0	Conduct and publish behavioral and sentiment research relating to incentive results.	13	60
2	ST	9	4	0	Write Connected Communities Playbook	13	60
3	M	9	4	2	Deliver outline of Connected Communities Playbook	36	36
4	M	9	4	3	Deliver draft Connected Communities Playbook	48	48
5	M	9	4	4	Deliver final Connected Communities Playbook	60	60
2	G/NG	0	0	0	Completion of recruitment of buildings and DERs. Recipient will show DOE that we have commitment for at least 1 MW of load flexibility; we have the potential for at least 440 MWh energy savings and 320,000 CO2e reduced annually; the mix of buildings includes single- & multi-family homes and small & large commercial buildings, new & existing; at least 15% of the customers will be low- and medium-income; at least 4 types of DERs/controllable loads are installed. Complete installation of EE operational measures in first cohort of residential and commercial buildings (at least 2 residential, 2 small commercial, and 2 large commercial).	24	24
3	T	10	0	0	Retention	25	60

3	ST	10	1	0	Conduct annual customer surveys.	25	60
3	ST	10	2	0	Respond to customer queries.	25	60
3	ST	10	3	0	Adjust program in alignment with feedback.	25	60
3	M	10	0	1	Deliver annual report summarizing customer feedback and describe any adjustment to program offerings based on feedback.	36	36
4	M	10	0	1	Deliver annual report summarizing customer feedback and describe any adjustment to program offerings based on feedback.	48	48
5	M	10	0	1	Deliver annual report summarizing customer feedback and describe any adjustment to program offerings based on feedback.	60	60
3	M	10	0	2	Conduct and publish behavioral & sentiment research relating to incentive results.	36	36
4	M	10	0	2	Conduct and publish behavioral & sentiment research relating to incentive results.	48	48
5	M	10	0	2	Conduct and publish behavioral & sentiment research relating to incentive results.	60	60
4	M	10	0	3	Project retains a minimum of 75 participants.	48	48
5	M	10	0	3	Project retains a minimum of 75 participants.	60	60
3	T	11	0	0	Optimization of EE Measures and GSs	25	60
3	ST	11	1	0	Complete installation of EE measures (smart thermostats, connected lighting controls, heat pumps), and communications equipment (gateway and data acquisition devices).	25	36
3	M	11	1	1	EE measures installed in all buildings.	36	36
3	ST	11	2	0	Optimize EE measures to provide energy savings and grid services (VOLTRON™, ILC, TCC, AIRC _x and AFDD applications).	25	60
3	M	11	2	2	Deliver annual report on continued monitoring and optimization of installed EE measures.	36	36
4	M	11	2	2	Deliver annual report on continued monitoring and optimization of installed EE measures.	48	48
5	M	11	2	2	Deliver annual report on continued monitoring and optimization of installed EE measures.	60	60
3	ST	11	3	0	Complete additional installations of DERs in all residential, commercial, and industrial buildings.	25	36
3	ST	11	3	3	Complete installation and integration of additional DERs for all participants.	36	36
3	ST	11	4	0	Confirm that all hardware, software, and communications systems work.	25	36

3	ST	11	5	0	Engage DERs to provide grid services during winter, shoulder, and summer seasons.	25	36
3	M	11	0	4	Completion of initial grid services tests.	36	36
3	ST	11	6	0	Distribution of financial incentives to participants.	25	60
3	ST	11	7	0	Develop prototypical rate/incentive design used to engage DERs and building systems.	25	60
3	ST	11	8	0	Develop methods to facilitate access to data, operational dashboards, and results vs target values for each metric developed around solution packages.	25	36
3	M	11	8	5	Complete data dashboards.	36	36
4	ST	11	9	0	The team will recommend potential long-term products, programs, customer offerings, and rates for customers as well as test/simulation plans to validate	37	60
4	M	11	0	6	Deliver a preliminary report with recommendations for potential long-term activities, based on the performance of equipment packages in the field.	48	48
5	M	11	0	7	Deliver a final report with recommendations for potential long-term activities, based on the performance of equipment packages in the field.	60	60
4	ST	11	10	0	Deploy grid service optimization algorithms for laminar coordination simulation and testing.	37	48
5	M	11	0	8	Deliver report on performance of laminar coordination simulation and testing.	60	60
3	G/NG	0	0	0	Recipient will compile preliminary results from GS tests from all buildings, demonstrate how they compare with the minimum project targets (1 MW of load flexibility; we have the potential for 440MWh energy savings and 320,000 lb CO ₂ e reduced annually) and suggest any course correction, if needed. Recipient will also compile preliminary savings from operational EE measures. Playbook draft will be started and shared with DOE.	36	36
4	G/NG	0	0	0	Recipient will compile results from grid services tests and EE measures from all buildings and show that they are within 10% of the project goals.	48	48
5	FINAL	0	0	0	The project will complete a Connected Communities Playbook that will detail the business model and activities needed to efficiently deploy and manage packages of data sensors/control devices, EE measures, and DERs.	60	60