Logic Models for Workforce Education & Training's "Integrated Energy Education and Training" Sub-Program Components and Linkage Explanation

This document elucidates the program theory that underlies the Integrated Energy Education and Training (IEET) Sub-Program, the regionally implemented part of the Workforce Education & Training (WE&T) Program. IEET is comprised of two components: Core Energy Education[1] and Technical Upskill. This Program Theory Logic Model (PTLM) memo documents how the activities, outputs, and short-, medium-, and long-term outcomes in each component are interconnected. The PTLM activities are listed from left to right and the outcome categories are listed in chronological order from top to bottom. The PTLM features arrows labelled with numbers and these arrows represent linkages. Below, we briefly explain each intervention strategy and the links in each logic model.

Methods

Opinion Dynamics started the PTLM development process by creating an initial PTLM that captured the core theory behind the IEET sub-program's two components, including their key activities, outputs of activities, and intended outcomes. This initial PTLM was informed by interviews with Investor-Owned Utility (IOU) program staff, review of IOU business plans, and review of program materials provided by IOUs. The evaluation team presented this initial PTLM to each IOU individually and solicited feedback about the accuracy of each element. In addition, we asked for recommendations for additional activities, outputs, and outcomes that should be added to the PTLM.

We used feedback from IOU staff to refine the PTLM, including developing a separate PTLM for each of IEET's two components as opposed to a single integrated model. We then met collectively with the IOUs several times to further refine the PTLMs and gain consensus across IOUs. Subsequently, we developed recommendations for Key Performance Indicators (KPIs) that can be used to assess the performance for each link in the PTLM.

A Note on KPIs and Other Terms

The KPIs listed in Tables 1 and 2 are potential metrics that both help to illuminate the linkages as well as support future WE&T Program evaluations. The IOUs collect data for their Business Plan metrics and other data that support many of the KPIs tied to Program outputs. The KPIs tied to outcomes will likely require additional studies to collect the necessary information. We do not suggest that information for every listed KPI be collected and measured. Instead, we recommend that at the outset of an evaluation of the WE&T Program and its Sub-Programs, the IOU(s) and the evaluator(s) discuss which links are in need of investigation based on how the program has unfolded and operated. Document reviews, surveys (aka post-course evaluations),

[1] PG&E calls this sub-program component Core Energy Education Collaboration (CEEC).

and pre/post tests may all be appropriate methods to collect KPI-supporting data and should be determined concurrently with evaluation priorities.

Core Energy Education

The Core Energy Education component addresses the needs of people on a post-secondary track toward an energy job/career. Primary organizations for strategic collaborations for this strategy include community colleges, four-year colleges, job training organizations, vocational schools, labor unions, trade associations, apprenticeship and pre-apprenticeship programs, and community-based organizations. Figure 1 presents the Core Energy Education PTLM.

Figure 1. Core Energy Education Logic Model

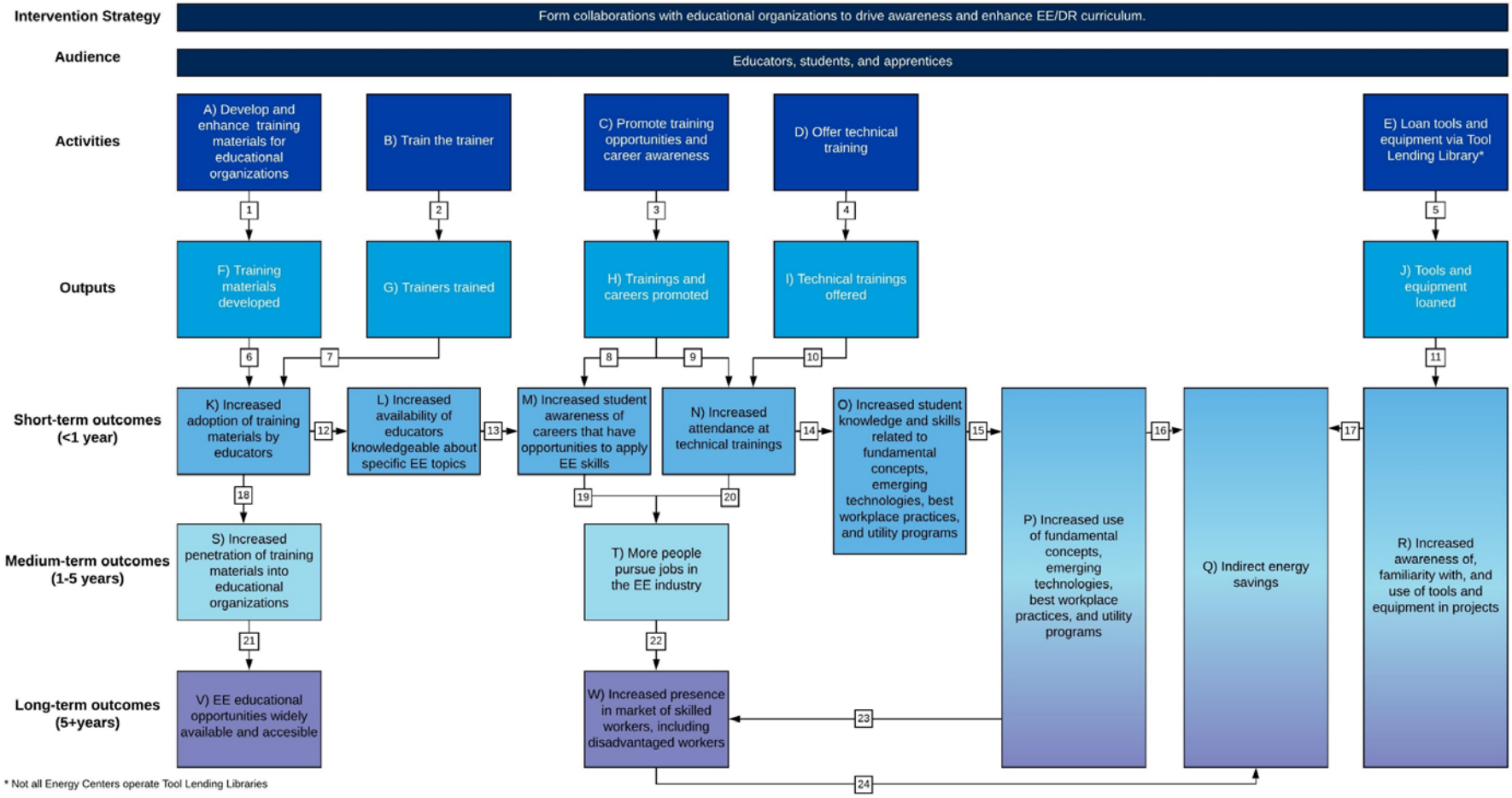

Table 1 explains the links between activities, outputs, and outcomes in more detail than can be represented in the PTLM. The table is organized by the link numbers. It is important to note that when we refer to energy efficiency (EE), often it also includes demand response (DR) and distributed generation (DG).

Table 1. Explanation of Links in Core Energy Education Logic Model

Link	Segment Theory	Potential Key Performance Indicators for Future Consideration
1	The output of the activity of ***developing and enhancing EE training materials for educational organizations (A)*** is ***training materials developed (F).*** The IOUs will develop statements of collaborations to jointly develop materials and resources. Oriented to educational institutions.	▪ # of statements of collaboration by Business Plan sector (e.g. residential, commercial, public, industrial) to jointly develop and/or share training materials and resources (required metric)
2	The output of the ***train-the-trainer activity (B)*** is the number of ***trainers trained (G).*** Oriented to trainers in educational institutions, including post-high school education and training programs such as certificate programs, pre-apprenticeship programs, apprenticeships, four-year college and universities, community colleges, and vocational training.	▪ # of statements of collaboration by Business Plan sector that include train-the-trainer activities ▪ # of trainers directly trained
3	The output of the promote ***training opportunities and career awareness activity (C)*** is the number of ***trainings and careers promoted (H).*** Oriented to students.	▪ # of statements of collaboration by Business Plan sector to promote training opportunities and career awareness (required metric) ▪ # of training opportunities promoted by Business Plan sector ▪ # of promotions about training opportunities by Business Plan sector
4	The output of the activity of ***offering technical training (D)*** is the number of ***technical trainings offered (I).*** These in-person trainings may be delivered at the Energy Centers or remote locations. Oriented to students and end-users.	▪ # of statements of collaborations by Business Plan sector to offer technical training ▪ # of trainings offered ▪ # of attendees at trainings ▪ # of unique training attendees ▪ # of disadvantaged worker[2] attendees

[2] A Disadvantaged Worker, as defined in D.18-10-008 (October 11, 2018), "Decision Addressing Workforce Requirements and Third Party Contract Terms & Conditions", defines a disadvantaged worker as "an individual that meets at least one of the following criteria: lives in a household where total income is below 50 percent of Area Median Income; is a recipient of public assistance; lacks a high school diploma or GED; has previous history of incarceration lasting one year or more following a conviction under the criminal justice system; is a custodial single parent; is chronically unemployed; has been aged out or emancipated from the foster care system; has limited English proficiency; **or** lives in a high unemployment ZIP code that is in the top 25 percent of only the unemployment indicator of the CalEnviroScreen Tool."

Link	Segment Theory	Potential Key Performance Indicators for Future Consideration
5	The output of the ***tools and equipment loaned via the Tool Lending Library (E)*** is the number of ***tools and equipment loaned (J).*** Not all Energy Centers operate Tool Lending Libraries. Oriented to students and end-users.	▪ # of statements of collaboration by Business Plan sector that include tool and equipment loans ▪ # of tools and equipment loaned ▪ # of loan transactions ▪ # of first-time tool and equipment borrowers ▪ # of first-time tool and equipment borrowers who are disadvantaged workers ▪ # of repeat tool and equipment borrowers ▪ # of repeat tool and equipment borrowers who are disadvantaged workers
6	The ***training materials developed (F)*** or enhanced for educational institutions lead in the short-term to ***adoption of those materials by educators at their institutions (K).*** Educator oriented.	▪ # of statements of collaboration by Business Plan sector that include training material development or enhancement ▪ # of educational institutions using materials ▪ # of trainers using materials ▪ # of topics covered by training materials (HVAC, Lighting, etc.)
7	The ***trainers trained (G)*** on EE curriculum leads, in the short term, to ***adoption of EE training materials (K)*** developed through collaborating with the utilities. The training includes instruction on how to use the materials. Educator oriented.	▪ # of educational institutions using materials ▪ # of trainers using materials ▪ # of students attending trainings where materials are utilized
8	A short-term outcome of ***promoting trainings and careers (H)*** is ***increased student awareness of careers that have opportunities to apply EE skills (M)*** This includes awareness of EE education pathways, and employment opportunities. Student oriented.	▪ # of students aware of careers that have opportunities to apply EE skills ▪ # of students considering a career that has opportunities to apply EE skills
9	Another short-term outcome of ***promoting trainings and careers (H)*** is ***increased attendance at technical trainings (N).*** As students become aware of EE trainings and careers, they will be more likely to enroll in trainings to qualify them to apply for EE jobs. Student oriented.	▪ # of students attending technical trainings by Business Plan sector ▪ # of trainings attended by Business Plan sector ▪ Percent of participation relative to eligible target populations (required metric)
10	A short-term outcome of ***offering technical trainings (I)*** is ***increased attendance at those trainings (N).*** Student oriented.	▪ # of students attending technical trainings by Business Plan sector ▪ # of trainings offered by Business Plan sector ▪ Percent of participation relative to eligible target populations (required metric)
11	A short-, medium-, and long-term outcome of the ***tools and equipment loaned (J)*** is ***increased awareness of, familiarity with, and use of EE tools and equipment in projects (R).*** Through interacting with staff at the Energy Centers, students and customers will learn what tools are available and how to use them properly. Student and end-user oriented.	▪ Increase in awareness of EE tools ▪ Increase in familiarity of EE tools ▪ # of tools and equipment loaned that were used in projects ▪ # of first-time tool and equipment borrowers ▪ # of repeat tool and equipment borrowers ▪ # of loan transactions

Link	Segment Theory	Potential Key Performance Indicators for Future Consideration
12	As ***educators increasingly adopt EE training materials (K)*** developed by collaborating with the utilities, a short-term outcome is ***increased availability in the market of educators knowledgeable about specific EE topics (L).*** Educator oriented.	▪ # of educators knowledgeable about specific EE topics available to teach classes
13	As the ***educators knowledgeable about EE (L)*** share their knowledge with students, a short-term outcome will be ***increased student awareness of careers that have opportunities to apply EE skills (M).*** Student oriented.	▪ # of students aware of careers that have opportunities to apply EE skills ▪ # of students considering a career that has opportunities to apply EE skills
14	A short-, medium-, and long-term outcome of ***increased attendance at technical trainings (N)*** will be ***increased student knowledge and skills related to fundamental concepts, emerging technologies, best workplace practices and utility programs (O).*** Student oriented.	▪ Measures of student knowledge and skills related to fundamental EE concepts ▪ Measures of student knowledge and skills related to emerging EE technologies ▪ Measures of student knowledge and skills related to best workplace practices ▪ # of students considering a career that has opportunities to apply EE skills ▪ # of students applying for utility programs
15	A short-, medium-, and long-term outcome of ***the increased student knowledge and skills related to fundamental concepts, emerging technologies, best workplace practices, and utility programs (O)*** will be the ***increased use of each of these (P).*** This outcome will be seen in the short-term as students may apply these practices immediately. In the medium- and long-term, students will be more likely to use emerging technologies and best workplace practices after they have been hired in the EE field. Student oriented.	▪ Increase use of fundamental EE concepts ▪ Increase use of emerging EE technologies ▪ Increase use of best workplace practices ▪ # of technical training attendees that report applying what they learned in the trainings ▪ # of technical training attendees who applied for participation in utility programs
16	As students ***use and apply knowledge and skills related to fundamental concepts, emerging technologies, best workplace practices, and utility programs (P),*** they will generate ***indirect energy savings (Q).*** The energy savings may be generated in the short, medium, and long term. Student oriented.	▪ Indirect energy savings generated ▪ # of technical training attendees that report energy-saving activities attributable to what they learned in the training(s)
17	As students have ***increased awareness of, familiarity with, and use of EE tools and equipment in projects (R),*** that will lead to increased ***indirect energy savings (Q)*** in the short, medium and long term. Student oriented.	▪ Indirect energy savings generated ▪ # of tool and equipment borrowers that report energy-saving activities attributable to what they learned in the training(s) ▪ # of tool and equipment borrowers that report energy-saving activities attributable to what they learned from interacting with staff at the Energy Center

Link	Segment Theory	Potential Key Performance Indicators for Future Consideration
18	As ***trainers adopt EE materials and use them to educate students (K),*** there will be ***increased penetration of training materials into educational organizations (S)*** *in the medium term*. Trainer oriented.	▪ Increase in classes with EE components at educational organizations ▪ Increase in EE-focused classes at educational organizations ▪ # of educational organizations using EE training materials
19	***Greater student awareness of employment opportunities in the EE industry (M)*** leads to ***more students pursuing EE-related jobs (T)*** in the medium term. Student oriented.	▪ # of students at educational institutions enrolled in EE curriculum who applied for jobs that have an opportunity to apply EE skills ▪ # of students at educational institutions enrolled in EE curriculum who applied for jobs that have an opportunity to apply EE skills and who also qualify as disadvantaged workers
20	The ***students who attended technical trainings (N)*** are likely to ***pursue EE-related jobs to use their knowledge, skills, and abilities (T)*** in the medium term. Pursuing a job is comprised of job searching or applying for a job, regardless of whether they were hired for the job. Student oriented.	▪ # of students at educational institutions enrolled in EE curriculum who applied for jobs that have an opportunity to apply EE skills ▪ # of students at educational institutions enrolled in EE curriculum who applied for jobs that have an opportunity to apply EE skills and who also qualify as disadvantaged workers
21	As ***EE training materials increasingly penetrate educational organizations' curriculum (S***), this will lead to a long-term outcome of ***EE educational opportunities becoming widely available and accessible to students (V),*** including disadvantaged students. Student oriented.	▪ # of educational organizations offering EE educational opportunities ▪ # of EE educational opportunities in high unemployment ZIP code that is in the top 25 percent of only the unemployment indicator of the CalEnviroScreen Tool
22	The ***educated students who pursued jobs in the EE industry (T)*** will get hired in jobs—that have an opportunity to apply EE skills--which will lead to ***an increased presence in the market of skilled EE workers, including skilled disadvantaged workers (W)*** in the long term. Student oriented.	▪ # of students at educational institutions enrolled in EE curriculum who are hired in jobs that have an opportunity to apply EE skills ▪ # of students at educational institutions enrolled in EE curriculum who are hired in jobs that have an opportunity to apply EE skills and who also qualify as disadvantaged workers
23	As the students who attended technical trainings ***increasingly use the fundamental concepts, emerging technologies, best workplace practices, and utility programs (P),*** that will contribute to a long-term outcome of ***increased presence in the market of skilled EE workers, including skilled disadvantaged EE workers (W).*** Student oriented.	▪ # of workers previously enrolled in EE curriculum at educational institutions who report using fundamental concepts ▪ # workers previously enrolled in EE curriculum at educational institutions who report using emerging technologies ▪ # of workers previously enrolled in EE curriculum at educational institutions who report using best workplace practices ▪ # of workers previously enrolled in EE curriculum at educational institutions who report using utility programs

Link	Segment Theory	Potential Key Performance Indicators for Future Consideration
24	The ***increased presence in the market of skilled EE workers, including disadvantaged workers (W)*** will lead to a long-term outcome of ***energy savings (Q)*** through actions like properly installed equipment.	▪ Indirect energy savings generated ▪ # of workers previously enrolled in EE curriculum at educational institutions that attribute energy-saving activities to training participation

Technical Upskill

The Technical Upskill intervention strategy addresses the needs of people in an EE-related job/career seeking energy-focused upskilling. A secondary audience includes people seeking to enter the EE job market (career transitioners). These people may include engineering and design professionals as well as technical trades and journeymen. Primary organizations for strategic collaborations for this strategy include university extension programs, certification agencies, and professional and trade associations. Figure 2 presents the Technical Upskill PTLM.

Figure 2. Technical Upskill Logic Model

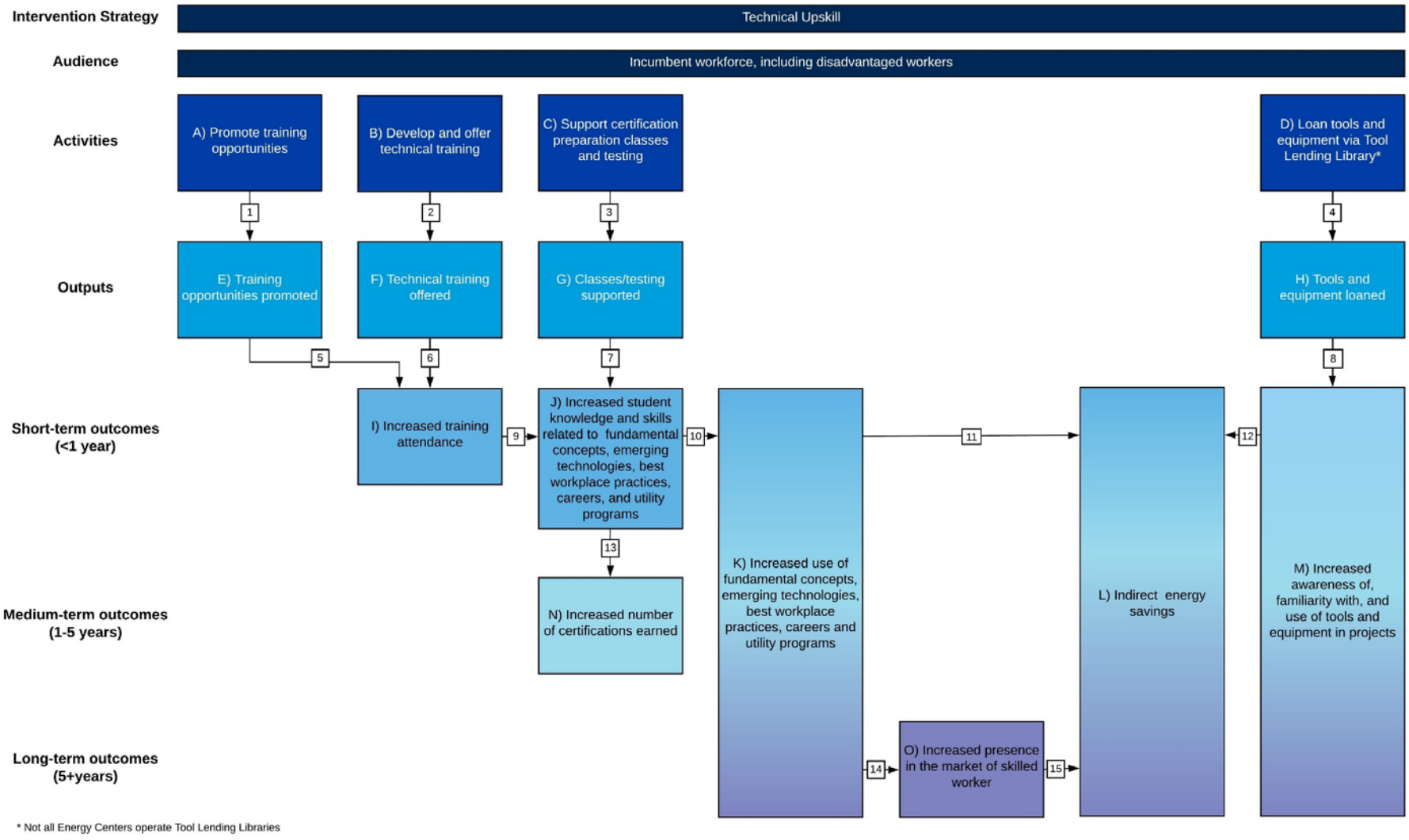

Table 2 explains the links between activities, outputs, and outcomes in more detail than can be represented in the Technical Upskill PTLM. The table is organized by the link numbers. It is important to note that when we refer to EE, often it also included the DR.

Table 2. Explanation of Links in Technical Upskill Logic Model

Link	Segment Theory	Potential Key Performance Indicators
1	The output of the ***promote training opportunities activity (A)*** is the number of ***training opportunities promoted (E).*** Oriented to incumbent EE workforce, including disadvantaged workers.	▪ # of statements of collaboration by Business Plan sector to promote training opportunities and career awareness (required metric) ▪ # of training opportunities promoted by Business Plan sector ▪ # of promotions about training opportunities by Business Plan sector
2	The output of the activity of ***developing and offering technical training (B)*** is the number of ***technical trainings offered (F).*** Oriented to incumbent EE workforce including disadvantaged workers.	▪ # of statements of collaborations by Business Plan sector to offer technical training ▪ # of trainings offered ▪ # of attendees at trainings ▪ # of unique training participants ▪ # of disadvantaged worker[3] attendees
3	The output of the ***support certification preparation classes and testing (C)*** is the number of ***certification preparation classes and tests supported (G).*** Oriented to incumbent EE workforce including disadvantaged workers.	▪ # of certification programs supported by Business Plan sector ▪ # of certification preparation classes supported by Business Plan sector ▪ # of certification tests supported by Business Plan sector ▪ % of certification test takers who are disadvantaged workers ▪ % of certification test takers who receive certification ▪ % of certification test takers who receive certification that are disadvantaged workers
4	The output of the activity **loaning** ***tools and equipment via the Tool Lending Library (D)*** is the number of ***tools and equipment loaned (H).*** Not all Energy Centers operate Tool Lending Libraries. Oriented to incumbent EE workforce including disadvantaged workers and end-users.	▪ # of statements of collaboration by Business Plan sector that include tool and equipment loans ▪ # of tools and equipment loaned ▪ # of loan transactions ▪ # of first-time tool and equipment borrowers ▪ # of first-time tool and equipment borrowers who are disadvantaged workers ▪ # of repeat tool and equipment borrowers ▪ # of repeat tool and equipment borrowers who are disadvantaged workers

[3] A Disadvantaged Worker, as defined in D.18-10-008 (October 11, 2018), "Decision Addressing Workforce Requirements and Third Party Contract Terms & Conditions", defines a disadvantaged worker as "an individual that meets at least one of the following criteria: lives in a household where total income is below 50 percent of Area Median Income; is a recipient of public assistance; lacks a high school diploma or GED; has previous history of incarceration lasting one year or more following a conviction under the criminal justice system; is a custodial single parent; is chronically unemployed; has been aged out or emancipated from the foster care system; has limited English proficiency; **or** lives in a high unemployment ZIP code that is in the top 25 percent of only the unemployment indicator of the CalEnviroScreen Tool."

Link	Segment Theory	Potential Key Performance Indicators
5	A short-term outcome of the ***training opportunities promoted (E),*** is ***increased attendance at those trainings (I).*** Oriented to incumbent EE workforce.	▪ # of students attending technical trainings by Business Plan sector ▪ # of trainings attended by Business Plan sector ▪ Percent of participation relative to eligible target populations (required metric)
6	A short-term outcome of ***offering technical trainings (F)*** is ***increased training attendance (I).*** Oriented to incumbent EE workforce.	▪ # of students attending technical trainings by Business Plan sector ▪ # of trainings offered by Business Plan sector ▪ Percent of participation relative to eligible target populations (required metric)
7	A short-term outcome of ***supporting certification preparation classes and their associated tests (G)*** is ***increased student knowledge and skills related to fundamental concepts, emerging technologies, best workplaces practices, careers in the EE market, and utility programs (J).*** Oriented to incumbent EE workforce including disadvantaged workers.	▪ Measures of attendee knowledge and skills related to fundamental EE concepts ▪ Measures of attendee knowledge and skills related to emerging EE technologies ▪ Measures of attendee knowledge and skills related to best workplace practices ▪ # of attendees who applied for participation in utility programs
8	A short, medium-, and long-term outcome of the ***tools and equipment loaned (H)*** is ***increased awareness of, familiarity with, and use of EE tools and equipment in projects (M).*** Through interacting with staff at the Energy Centers, workers learn which tools are available and how to use them properly. Oriented to incumbent EE workforce, including disadvantaged workers.	▪ Increase in awareness of EE tools ▪ Increase in familiarity of EE tools ▪ # of tools and equipment loaned that were used in projects ▪ # of first-time tool and equipment borrowers reporting use in projects ▪ # of repeat tool and equipment borrowers reporting use in projects
9	With ***increased attendance at technical trainings (I),*** that will lead to a short-term outcome of ***increased student knowledge and skills related to fundamental concepts, emerging technologies, best workplace practices, best workplaces practices, careers in the EE market, and utility programs (J).*** An example of increased awareness of EE careers among the incumbent workforce would be an HVAC technician who learns about whole-building approaches and then pursues a new career as a Building Operations Systems Technician. Oriented to incumbent EE workforce including disadvantaged workers.	▪ Measures of technical training attendees' knowledge and skills related to fundamental EE concepts ▪ Measures of technical training attendees' knowledge and skills related to emerging EE technologies ▪ Measures of technical training attendees' knowledge and skills related to best workplace practices ▪ # of technical training attendees applying for utility programs
10	A short-, medium-, and long-term outcome of the ***increased student knowledge and skills related to fundamental concepts, emerging technologies, best workplace practices, best workplaces practices, careers in the EE market, and utility programs (J)*** will be the ***increased use of each of those (K).*** Oriented to incumbent EE workforce including disadvantaged workers.	▪ Increased use of fundamental EE concepts ▪ Increased use of emerging EE technologies ▪ Increased use of best workplace practices ▪ # of technical training attendees that report applying what they learned in the trainings ▪ # of attendees who applied for participation in utility programs

Link	Segment Theory	Potential Key Performance Indicators
11	A short-, medium-, and long-term outcome of the ***increased use of fundamental concepts, emerging EE technologies, best workplace practices, careers in the EE market, and utility programs (K)*** will be ***increased indirect energy savings (L).***	▪ Indirect energy savings generated ▪ # of technical training attendees that report energy-saving activities attributable to what they learned in the training(s) ▪ Barriers to applying what they learned reported by technical training attendees
12	A short-, medium-, and long-term outcome of the ***increased awareness of, familiarity with, and use of EE tools and equipment in projects (M)*** will be ***increased indirect energy savings (L).***	▪ Indirect energy savings generated ▪ # of tool and equipment borrowers that report energy-saving activities attributable to what they learned from interacting with staff at the Energy Center
13	A medium-term outcome of ***increased student knowledge and skills related to fundamental concepts, emerging technologies, best workplace practices, best workplaces practices, careers in the EE market, and utility programs (J)*** will be an ***increased number of industry certifications earned in the market (N).***	▪ # of certifications earned by Business Plan sector ▪ # of certification test takers who receive certification ▪ # of certification test takers who receive certification that are disadvantaged workers
14	A long-term outcome of the ***increased use of fundamental concepts, emerging EE technologies, best workplace practices, careers in the EE market, and utility programs (K)*** will be an ***increased presence in the market of skilled EE workers, including skilled disadvantaged workers (O).***	▪ # of workers who attended a technical training who report using fundamental concepts ▪ # of workers who attended a technical training who report using emerging technologies ▪ # of workers who attended a technical training who report using best workplace practices ▪ # of workers who attended a technical training who report using utility programs
15	A long-term outcome of an ***increased presence in the market of skilled EE workers (O)*** will be *increased* ***indirect energy savings (L).***	▪ Indirect energy savings generated ▪ # of workers that attribute energy-saving activities to training participation