Draft Detailed Workplan for:

The Industrial/Agricultural Market Saturation Study

Prepared for:

California Public Utilities Commission

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Contents

1. Overview

This document is the detailed work scope for the Industrial/Agricultural Market Saturation Study. It adds additional detail to a higher-level work scope that the CPUC approved in March 2020.

2. Research Objectives

The primary goal of this study is to develop estimates of the current and future market penetration of energy efficiency technologies for six California industrial and agricultural subsectors. This information will feed into the CPUC's Potential and Goals (PG) study. In order to achieve this goal, the key research objectives of this study include:

- Identifying which energy efficiency technologies/systems have the greatest potential for future energy savings in six prioritized industrial and agricultural subsectors in California;
- Identifying the current market penetration of these key energy efficiency technologies/systems;
- Determining what barriers are preventing wider adoption of these energy efficiency technologies/systems. Included among these possible barriers will be interactions with other demand side resource options such as demand response and self-generation; and
- Projecting the future market penetration[1] of these energy efficiency technologies both with and without program interventions[2].

3. Information Sources

The study will derive its findings and recommendations from the following information sources:

- *Literature/database review:* The evaluation team will complete a literature review of published reports and databases which provide information on energy consumption patterns and energy savings potential in the six large California industrial and agricultural subsectors
- *Subsector expert interviews:* The team will complete in-depth interviews with individuals who have specialized knowledge of energy consumption patterns and energy savings potential in

[1] In most cases, we plan to measure energy efficient market penetration at the equipment level such as the percentage of motors with variable speed drives or the percentage of boilers that are high efficiency. However, in some cases the most promising energy efficiency improvements may involve changes in processes or systems that may not lend themselves to a "widget-based" approach and where the denominator may not be a piece of equipment but a specific process or activity. More information on how we plan to expand sample-level results to the whole California market and convert these market penetration estimates to energy savings and consumption estimates appears later in this work plan.

[2] Some program interventions may promote integrated customer solutions which might reduce opportunities for energy efficiency for the sake of promoting other demand side options such a self-generation or demand response.

the six large California industrial and agricultural subsectors. These experts may include program evaluators and implementers who are knowledgeable not only about energy efficiency programs and project opportunities but also about programs/projects involving other demand-side options (e.g., demand response and self-generation incentive programs).

- *Equipment vendor interviews:* The team will complete in-depth interviews with vendors who sell energy-efficient equipment to these six large California industrial and agricultural subsectors.
- *End user interviews:* The team will complete in-depth interviews with California industrial and agricultural customers who operate in these key subsectors.

Sections 4.2 and Section 4.3 provide more details on these information sources. Table 1 maps these information sources to the study's research objectives and rates their relative importance for achieving the research objectives.

Table 1: Mapping Information Sources to Research Objectives

Information Sources	Identifying Technologies/ Systems with High Energy Savings Potential	Identifying Current Market Penetration of Key Technologies/ Systems	Determining Barriers to Wider Adoption of Key Technologies/ Systems	Projecting Future Market Penetration of Key Technologies/ Systems
Literature/database review	P	S	s	s
Subsector expert interviews	P	P	P	P
Equipment vendor interviews	s	P	P	P
End user interviews	s	P	P	s

P = primary information source

s = supplementary information source

The table shows that while the team expects the literature/database review to be very useful for identifying promising technologies/systems, it expects this review to be less useful for barrier determination or estimating current and future market penetration. In the evaluation team's experience, barriers to the adoption of specific technologies/systems are topics that are underexplored in this literature. While technical potential studies do project future energy-efficiency penetration, out of necessity these projections are usually made at more aggregate

levels such as whole sectors (industrial, agricultural, etc.) rather than subsectors and technology groups rather than specific measures.

While the team expects the subsector expert interviews, in aggregate, to be very useful for all the research objectives, it is likely that any particular expert might not be able to provide useful information for all these research objectives. For example, an industrial key account manager for one of the PAs may provide useful information on current technology penetration and barriers for the customers they are familiar with but may be reluctant to expand this experience to the whole California market.

In theory, the equipment vendors should be able to provide useful information for all the research objectives. However, this study is staged to interview these vendors after the "short list" of high energy savings potential technologies/systems has already been identified. The end user interviews also come after this technology identification stage. The small size of the end user samples (10 per subsector) also limits their usefulness as a primary source for market penetration estimates although they do have value as a supplementary information source.

4. Work Plan

This section describes the specific research tasks including their primary activities and deliverables.

4.1 Kickoff Meeting and Subsector Selection

The study will begin with a kickoff meeting involving CPUC staff representing the oversight of various demand-side programs as well as the managers of the evaluation team. The objectives of this meeting will include:

- Summarizing the research objectives and evaluation activities;
- Reviewing the project timeline and key deliverables;
- Discussing CPUC comments on the draft detailed workplan;
- Deciding which industrial and agricultural subsectors the study should focus on;
- Discussing the coordination of data collection with other active program evaluations or market studies;
- Brainstorming about other possible information sources besides those already mentioned in this plan;
- Discussing the best approach for gaining the cooperation of PA key account managers for this study; and

- Agreeing on protocols for CPUC and evaluation team communications and status updates.

To inform the decision as to which industrial subsectors the study should focus on, Table 2 shows the top five industrial subsectors based on their average share of this forecasted electric and gas consumption over the 2020-2030 period. The forecasts come from the California Energy Commission's (CEC's) Integrated Energy Policy Report (IEPR) model.

Table 2: Top Five California Industrial Subsectors for Future Electric and Gas Consumption

Subsector	% of 2020-2030 IEPR Forecasted Electric Consumption	% of 2020-2030 IEPR Forecasted Gas Consumption
Petroleum	19%	52%
Food Services	16%	18%
Chemical Manufacturing	10%	11%
Electronics/Semiconductor	13%	1%
Stone-Glass-Clay	7%	6%

Source: CEC IEPR projections

The evaluation team proposes focusing on the three of the top five of these –Food Services, Chemical Manufacturing, and Electronics/Semiconductor. The Petroleum subsector has other drivers influencing energy decisions and current market status is unknown, thus that subsector is excluded. While the Stone-Glass-Clay subsector is comparable to Electronics/Semiconductor subsector in future energy consumption (when one adds together the electric and gas shares), we anticipate that Stone-Glass-Clay subsector encompasses a more heterogeneous group of companies than the Electronics/Semiconductor subsector. This heterogeneity makes generalizing findings across the subsector more difficult and less meaningful for individual companies within the subsector.

In addition to three industry subsectors, this study also plans to study three agricultural sectors. Table 3 shows the subsector breakdowns of IEPR forecasts for 2025 California agricultural electric and gas consumption. Here the problem of subsector heterogeneity is even more pronounced since the IEPR categories combine very different activities (e.g., fishing and dairy farming).

Table 3: Top Agricultural Subsectors for Future Electric and Gas Consumption

Program Administrator	Agricultural Subsector	% of 2025 IEPR Forecasted Agriculture Electric Consumption	% of 2025 IEPR Forecasted Agriculture Gas Consumption
PG&E	Dairies, Fishing and Hunting	17%	10%
	Irrigated Agriculture, Vineyards, Forestry and Greenhouses	50%	85%
	Water Pumping	32%	4%
SCE	Dairies, Fishing and Hunting	9%	
	Irrigated Agriculture, Vineyards, Forestry and Greenhouses	73%	
	Water Pumping	4%	
SCG	Dairies, Fishing and Hunting		15%
	Irrigated Agriculture, Vineyards, Forestry and Greenhouses		64%
	Water Pumping		21%
SDG&E	Dairies, Fishing and Hunting	4%	1%
	Irrigated Agriculture, Vineyards, Forestry and Greenhouses	21%	77%
	Water Pumping	75%	22%

Note: The Dairies, Fishing and Hunting subsector most closely maps with the NAICS codes 112 (Animal Production and Aquaculture) and 114 (Fishing, Hunting, and Trapping). The Irrigated Agriculture, Vineyards, Forestry and Greenhouses subsector most closely maps with NAICS codes 111 (Crop Production) and 113 (Forestry and Logging). The NAICS code 22131 (Water Supply and Irrigations Systems) is the closest match with Water Pumping.

Considering all these factors, and after subsequent discussions with the CPUC, the evaluation will study the Greenhouse, Dairy and Water Pumping subsectors. The Greenhouse subsector is the primary source of natural gas consumption in the agricultural sector and a significant contributor to electric consumption. There are also quite a variety of energy-efficient technologies that are applicable to greenhouses ranging from LED lighting to boiler economizers and building shell measures. The cannabis industry has also led to increasing demand for greenhouse capacity in recent years.

The Water Pumping subsector is the largest contributor to agricultural electric consumption. In addition, the CPUC is interested in more research on the relationship between water pumping demand and high yield, water intensive California crops such as almond production.

While the Dairies subsector is not as large a contributor to California agriculture electric consumption as water pumping, it can benefit from a wider variety of energy-efficient measures. In addition, a high-level search of California energy efficiency program evaluations and market studies indicates that the dairy subsector has been less studied than the water pumping subsector.

In summary the evaluation team recommends that the study focus on the following industrial and agricultural subsectors:

- Food Services
- Chemical Manufacturing
- Electronics/Semiconductor
- Greenhouses
- Dairy
- Water pumping (crosscutting with the agricultural sector only)

Deliverables:

- Final detailed work plan which addresses CPUC edits on the draft work plan and any revisions to study scope discussed during the kickoff meeting.

4.2 Technology/System Identification Stage

The first stage of these market studies will be to conduct both a literature/database review and in-depth interviews with subsector experts to identify:

1) *Which technologies/systems currently use the most energy in these industrial/agricultural subsectors*
2) *Which technologies/systems have the greatest potential for future energy savings:* This would be limited to technologies which already have some quantifiable baseline

3) *What would be the energy-efficient and baseline/standard efficiency versions of these technologies/systems to document savings (and if the efficient version is preferred over standard)*[3]

4) *What would be best way to estimate the market potential of EE technologies for a given California subsector*

5) *What barriers might delay or discourage installation of promising EE technologies including end user consideration of other demand side options (e.g. demand response, self-generation)*

4.2.1 Literature/Database Review

The literature/database review will cover a variety of relevant sources including:

- Energy Information Administration's Manufacturing Energy Consumption Survey (MECS);
- Any published CPUC or CEC studies;
- CEC's Integrated Energy Policy Report (IEPR) model.
- U.S. Department of Energy's (DOE's) Industrial Assessment Center (IAC) audit database;[4]
- California IOU Emerging Technology Reports
- Reports from the Emerging Technologies Coordinating Council
- DOE's Energy Efficiency & Renewable Energy Emerging Technologies Database
- Conference papers from energy efficiency organizations such as ACEEE and IEPEC
- Publications from DOE's Advanced Manufacturing Office
- Information from the U.S. DOE's Better Plants Initiative including its ISO 50001 Ready Program
- Publications from federal energy research labs
- California agricultural statistics

[3] An industry standard practice assessment is not in scope.

[4] The database currently includes 19,105 assessments, 1,314 of which took place in California. Counting only the most recent assessments (2014 or later) there are 2,837 total assessments with 205 of these having been completed in California.

- Published energy efficiency evaluation reports focusing on the industrial and agricultural sectors
- Other relevant conference/white papers from online searches.

Among the published CPUC and CEC studies, the CPUC Energy Efficiency Potential and Goal (PG) studies should be useful resource since these have looked at California industrial and agricultural measures in some detail including emerging technologies. This study does not plan to focus on newly emerging technologies since it wants technologies which already have some measurable market penetration so that a baseline can be determined. However, some of the energy-efficient technologies which the PG studies had identified 3-4 years ago as "emerging" may now be more mature.

We plan to use the MECS to develop a high-level understanding as to which industrial end users are the most energy intensive. We then plan to use the IAC audit database to identify which energy efficiency recommendations are most commonly associated with these end uses. This initial analysis will allow us to focus the expert interviews on a shorter list of energy efficiency measures (although we will also allow the experts to add their own suggestions of energy efficiency measures which are not on the "short list").

4.2.2 Subsector Expert Interviews

The in-depth interviews will focus on a variety of experts including:

- In-house experts from DNV GL and Guidehouse;
- Experts with industry-specific expertise as identified by the literature review;
- Practitioners / experts on Strategic Energy Management (SEM);
- Trade association representatives;
- Industrial/ag key account representatives from the California utilities[5]

The expert interviews will address the following researchable questions: 1) which technologies use the most energy, 2) which technologies have the greatest energy savings potential; 3) what would be the energy-efficient and baseline/standard efficiency versions of these technologies; and 4) What types of product vendors would be best able to estimate market penetration of EE technologies). 5) What other kinds of demand side technologies are these sectors employing to manage their energy consumption and how does this impact EE implementation?

[5] Key account representatives are useful sources of information on energy efficiency market penetration and barriers because they have routine discussions with industrial and agricultural customers about implementing energy efficiency projects. They can also be useful for facilitating access to knowledgeable end-user contacts in the industrial and agricultural sectors. However, gaining access to these key account reps will depend on cooperation from the California utilities.

Table 4 shows that we plan to complete up to 10 expert interviews for each subsector for a total of up to 60 expert interviews. It is possible that for some subsectors we may not be able to identify 10 qualified experts. In addition, some of the expert interviews (e.g., interviews with PA key account representative or SEM experts) will likely cover multiple subsectors in a single interview.

Table 4: Subsector Expert Interviews

Proposed Subsector	# of Expert Interviews
Food Services	10
Chemical Manufacturing	10
Electronics/Semiconductor	10
Greenhouses	10
Dairy	10
Water Pumping	**10**
Total	**60**

4.2.3 Developing the List of Target Technologies/systems

Using this literature review and these expert interviews, DNV GL will compile a list of three EE technologies/systems for each of these six industrial/agricultural sectors. It is likely that there will be some overlap in these technologies/systems across the various market sectors. If time permits, the evaluation team will use a quasi-Delphi approach where it will email the initial set of target technologies to the expert interviewees for their feedback on the initial list, including information other, non-EE technologies these sectors are installing. The evaluation team will also review the current and relevant deemed California-based data (for example, DEER and any relevant utility workpapers) to determine appropriate non-efficient baselines for the targeted technologies.

The main deliverable for this research phase will be a memorandum which lists the target technologies/systems identified, the justifications for including them, and a brief summary of the evidence (e.g., published papers, expert interviews) used to inform the technology selection process.

If the CPUC reviewers agree with the list of target technologies/systems, the evaluation team will proceed to the market penetration estimation phase. If the CPUC reviewers would like other measures to be added or removed from the list, some additional research would be needed.

The final version of the memorandum will address any edits or comments from the CPUC reviewers.

Deliverables:

- Draft and final versions of the industry expert interview guides
- A memorandum listing the target technologies/systems identified, the justifications for including them, and a brief summary of the evidence and related findings.

4.3 Market Penetration Estimation Stage

The next stage of the research will be to produce estimates of the market penetration of energy-efficient versions of the target technologies/systems both with and without program intervention.

4.3.1 Equipment Vendor and End User Interviews

Most of these market penetration estimates will be based on in-depth interviews with equipment vendors. However, for each industrial/agricultural sector we plan to also interview a small sample of facility managers.

The evaluation team will develop its lists of equipment vendors and the facility managers from the following sources:

- Company databases from InfoGroup with sample frames pulled based on industry specific NAICS codes;
- PA lists of participating vendors;
- Program tracking data for industrial and agricultural programs;
- Membership lists from relevant trade associations (if available); and
- PA lists of vendor marketing lists (if lists exist).

The Infogroup data will be the primary source because in theory it will be more representative of the general populations of equipment vendors and end-use customers than program data which will be biased towards companies or vendors who are more proactive about energy efficiency.

The equipment vendor interviews will focus on:

- Their estimates of the current California market penetration of the energy-efficient versions of the technologies they sell;
- How much they expect this energy-efficient market share to change in the next five years both with and without energy efficiency program interventions;
- Which technologies/systems have the greatest potential for future energy savings;

- If technology X is just an energy-efficient version of an existing technology (e.g., a more efficient boiler or motor), calculate the % savings of baseline (research team will apply the technology as a percent of end use or annual facility consumption, unless interviewee has the data);
- If technology X is a control or process change, calculate % savings applicable to the controlled technology or replaced process (research team will apply the technology as a percent of end use or annual facility consumption, unless interviewee has the data);
- What are the relative costs differences (in % terms) between the energy efficient versions of the technologies they sell and the baseline efficiency models;
- What are the primary barriers to implementing the energy-efficient versions of these technologies, and how these barriers differ between larger and smaller companies, Including competing factors from other demand side energy reduction technologies (if so which ones), if any,
- Information on company size (e.g., number of employees or annual equipment production volumes to allow weighting of the market share estimates); and
- Any vendor understanding of where opportunities exist if appropriate customer education, program intervention, exist that capitalize on whole facility integrated demand side energy management and reduction solutions. (ex: where does EE fit in to the larger picture and what makes EE programs effective)

The facility manager interviews will ask them:

- Whether they use technology X in their facility?
- Whether they have heard of technology X?
    - [IF AWARE OF TECHNOLOGY X]
        - Whether they considered installing the technology
        - What factors/barriers prevented them from installing the technology
        - What factors/drivers would get them to install the technology
        - Whether program incentives or technical assistance or promotion of integration of other demand side technologies would increase the likelihood of them installing the technology
    - What barriers in their industry exist that might stall the adoption of the energy efficient technologies, including non-energy related barriers, if any.
- If technology X is just an energy-efficient version of an existing technology (e.g., a more efficient boiler or motor), calculate the % savings of baseline (research team will apply

the technology as a percent of end use or annual facility consumption, unless interviewee has the data)

- If technology X is a control or process change, calculate % savings applicable to the controlled technology or replaced process (research team will apply the technology as a percent of end use or annual facility consumption, unless interviewee has the data)
- Whether they have, or plan to have, onsite distributed generation at their facility
    - [IF YES] What type of distributed generation it is/will be (e.g., PV, biogas, fuel cell, etc.)
    - [IF YES] What they plan to use (or are using) the distributed generation for (e.g., For specific process energy applications? Or for general consumption reduction?)
- Whether they are participating, or plan to participate, in demand response programs
- How they value energy efficiency compared to other demand side options, in terms of relevancy and importance for reducing energy usage at their facility
- Where opportunities exist if appropriate customer education, program intervention, exist that capitalize on whole facility integrated demand side energy management and reduction solutions. (ex: where does EE fit in to the larger picture and what makes EE programs effective)

For the barriers to adoption questions, we will coordinate with the other evaluation team which is conducting Group E market studies for the residential and commercial sectors, to ensure that the barriers questions are asked in a similar manner. For example, the end user interviews will ask the interviewees to classify the severity of the barriers using a standardized scale developed by the DOE. This scale classifies barriers as either an Extreme Barrier, a Moderate Barrier, Somewhat of a Barrier, a Slight Barrier, or Not a Barrier. Using this standard classification of barrier severity will allow for more valid comparisons of energy efficiency potential across larger market sectors.

Ideally end-user interviews would take place in a focus group environment where the end users could react to the responses of others, comment on market barriers that they had not previously considered, etc. However, we expect it will not be feasible to get representatives of large industrial facilities together for a focus group due to the current pandemic crisis However, to capture some of the benefits of a traditional focus group, we plan to first conduct individual phone interviews and then schedule an “expert panel” group conference call where the compiled survey responses could be discussed by the whole group, with the evaluation team acting as facilitators for the discussion.

Table 5 shows that we plan to complete up to 50 equipment vendor interviews for each subsector for a total of up to 300 vendor interviews. Since each subsector will have three

technology/systems targeted, this means that we plan to complete 16-17 vendor interviews for each technology/system. However, it is likely that the populations of vendors will vary by equipment type and for some technologies it may be difficult to find 16-17 vendors let alone complete interviews with them.

To maximize the impact of the small end-user samples, we plan to target mostly larger customers. However, we do plan to schedule a few end-user interviews with small to medium-sized companies in each subsector. These small/medium customer interviews, along with the barrier questions posed in the vendor surveys mentioned above, should shed light on whether market barriers to energy efficiency differ between customers of varying sizes.

Table 5: Equipment Vendor and End User Interviews

Proposed Subsector	# of Equipment Vendor Interviews	# of End User Interviews
Food Services	50	10
Chemical Manufacturing	50	10
Electronics/Semiconductor	50	10
Greenhouses	50	10
Dairy	50	10
Water Pumping	**50**	**10**
Total	**300**	**60**

The evaluation team will develop draft interview guides for each equipment vendor and end user group and submit these for CPUC review. We expect the interview guides to have many common elements with a few customized batteries of technology-specific questions. A final version of these interview guides will incorporate any comments, edits provided by the CPUC reviewers.

The evaluation team will also coordinate with Group D on data collection efforts. Group D is targeting the industrial and agricultural sectors for the Custom evaluation.

4.3.2 Estimation Market Penetration

The final analysis step will be taking the technology-specific energy efficiency market penetration estimates and scaling them up to a higher-level aggregation. Depending on what the CPUC hopes to learn from this research, this aggregation could be done at the subsector

level (e.g., petroleum) or at the end use level (e.g., the Energy Information Administration's Manufacturing Energy Consumption Survey (MECS) end use categories[6]).

To accomplish this scaling, the evaluation team will rely on a "preponderance of the evidence" approach which will draw upon the following data sources:

- The plant manager's own estimate of how much the target technology/system accounts for total end use or total plant consumption;
- Data on similar facilities from California industrial energy audits;
- Industrial baseline studies from other states (e.g., Massachusetts); and
- The MECs survey data.
- The Infogroup commercial database
- Information collected from the expert, vendor, and end-user interviews about the prevalence in the subsector of other demand-side resources besides energy efficiency that may, if significant, impact the certainty of future energy efficiency implementation.[7] .

In most cases we plan to measure energy efficient market penetration at the equipment levels such as the percentage of motors with VFDs or the percentage of boilers that are high efficiency. However, we acknowledge that in some cases the most promising energy efficiency improvements may involve changes in processes or systems that may not lend themselves to a "widget-based" approach and where the denominator may not be a piece of equipment but a specific process or activity.

Equipment types can also vary widely in size or capacity. While we will likely not be able to get precise size/capacity information for the equipment through a phone interview, we will ask the interviewees to provide some rough estimates as to what size bins (e.g., small, medium, and large based on horsepower or Btuh).their equipment would fall into. In cases where energy efficient measures are processes rather than equipment types, we will try to get some indication of volume such as gallons or tons of throughput per day.

While we expect most of the vendors to be willing to give market penetration estimates for the whole California market, for the plant manager interviews we will need to use ratio estimation methods to expand what they are reporting in the small sample (10 interview per industry) to the whole California market. We can use data from Infogroup, which has employment numbers for all the companies in California for a given NAICS code, for this expansion.

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[6] These include: Conventional Boiler Use, CHP and/or Cogeneration Process, Process Heating, Process Cooling and Refrigeration, Machine Drive, Electro-Chemical Processes, Other Process Use, Facility HVAC, Facility Lighting, Other Facility Support, Onsite Transportation, Conventional Electricity Generation, and Other Nonprocess Use.

[7] If competition with energy efficiency from other demand-side resources appears to be a significant factor, this study will suggest high-level evaluation objectives that could help provide more detailed information on this issue.

To convert these market penetration estimates to energy savings, we will rely mostly on manager's own estimate of how much the target technology/system accounts for total end use or total plant consumption. For example, if there was technology X that could make process heating more efficient, we would ask the plant managers about what percentage of their process heat capacity is using technology X. Combining their responses, we would calculate the overall penetration of technology X as:

> *SUM [(% efficient) x (% gas use) x (annual therms)] / SUM [(% gas use) x (annual therms)]*

From the equipment vendors we plan to get the % of capacity or % of applicable sales volume ($) that has the energy efficient feature, along with whatever metric we can get on total capacity, sales volume, and employment. In cases where data like capacity is unavailable from some interviewees, we can interpolate with ratios such as capacity per unit of employment from interviewees who were able to provide this information. Combining the vendor responses, we would calculate the overall penetration of technology X as:

> *SUM [(% efficient) x (annual sales in units of capacity or $ or employment)] / SUM [(annual sales)]*

To fill in other gaps of information we plan to rely on secondary sources such as data on similar facilities from California industrial energy audits, industrial baseline studies from other states the MECs survey data, and the other data sources listed at the beginning of this section. The team will produce both unweighted market penetration estimates and weighted estimates based on the relative size of the equipment vendor or facility manager providing the estimate.

Deliverables:

- Draft and final versions of the equipment vendor and end user interview guides
- Draft and final reports (see next section)

4.4 Reporting

The final deliverable will be a report with a separate section for each of the targeted industrial/agriculture sectors. The content of the report will include:

- A summary of the data collection approach (both primary and secondary data collection efforts) and any challenges the evaluation team encountered collecting the necessary information;
- A list of the targeted technologies/systems along with the justifications for including them;
- A matrix showing the three key technologies for each industrial/ag sector and containing:

  - The estimated current EE market shares (both weighted and unweighted);
  - Projected market shares for five years in the future (if enough equipment vendors were able to provide these projections); and
  - A brief discussion of any barriers to adoption identified by either the equipment vendors or the facility managers.
- A cross-cutting summary section discussing issues, themes, and trends which cut across multiple industry/ag sectors and multiple target and competing technologies
- Conclusions and recommendations for future research.

4.5 Timeline

The estimated timeline for this study is illustrated below.

	2020														
Task	**March**		**April**		**May**		**June**		**July**		**Aug**		**Sep**		**Oct**
Task 1: Work Plan & Project Management															
Draft and final work plan															
Project management															
Task 2: Technology/System Identification Stage															
Interview guide development & approval															
Literature review															
Industry expert interviews															
Memo on target technologies/systems							D	F							
Task 3: Market Penetration Estimation Stage															
Vendor and customer interviews															
Market penetration estimation															
Reporting													D	F	