



Design and Implementation Activity

Agricultural Energy Design

Code 120

Definition

Plan, design, and document one or more conservation practices that address inefficient energy use.

Applicable Land Uses

All NRCS recognized land uses.

REQUIREMENTS

General Requirements

A Design and Implementation Activity (DIA) assists a participant with implementing their conservation plan by providing site-specific instructions, requirements, plans, or specifications for putting conservation practices and enhancements on the land.

A DIA may involve providing assistance for a single conservation practice or a combination of structural, vegetative, or land management conservation practices, enhancements, and management activities.

Prior to initiation of the DIA, the Technical Service Provider (TSP) will schedule a conference with the participant and Natural Resources Conservation Service (NRCS) field office staff to ensure an understanding of the participant objectives (including practices to be covered by the DIA), required deliverables, and characteristics of the DIA tasks. The meeting between all parties may take place in person or electronically.

The participant and conservation planner have determined which practices a TSP will provide DIA assistance for. The TSP must have certification in NRCS Registry for each practice they will provide assistance for through this DIA. If not certified for a practice(s), a TSP can use a subcontractor who is a certified TSP for the practice(s). If there are no available certified TSPs, then that practice shall be removed from the scope of the participant's DIA.

DIA assistance is based on the participant's conservation plan and applicable conservation practice standards and related technical guidance provided in the NRCS Field Office Technical Guide (FOTG). Each NRCS State Office publishes appropriate technical guidance and reference information in the state's version of the FOTG. DIA assistance must conform with the conservation practice standards included in FOTG, Section 4 for the state where the practice(s) are to be implemented. A TSP may use conservation practice supporting documents found in the applicable state's FOTG, Section 4 to facilitate delivery of appropriate information to the participant.

Examples of conservation practice supporting documents include statements of work (SOW), implementation requirements (IR), practice specifications (PS), standard drawings (SD), General Specifications (GS), Construction Specifications (CS), Material Specifications (MS), and design support tools. The FOTG homepage hyperlink is: <https://efotg.sc.egov.usda.gov/#/>.

Technical Requirements

The TSP will complete Preliminary and Final Designs for structural practices as outlined in each state adopted Conservation Practice Standard (CPS), Statement of Work (SOW), and the NRCS National Engineering Manual (NEM). Required tasks in the NEM include:

- 1) Preliminary engineering work, site investigations, data collection, and documentation.
- 2) Adherence to CPS criteria, preliminary alternatives, and cost estimates.
- 3) Participant's selection.
- 4) Preparation of final plans and specifications based on participant's selection(s).
- 5) Design report and engineer's cost estimate.
- 6) Operation and maintenance plan.
- 7) Quality assurance plan.

This DIA includes one or more conservation practices that are derived from recommendations in an NRCS approved assessment or tool used to evaluate energy conservation opportunities and assists with the participant's objective to improve on-farm energy efficiency.

The activity will meet the NRCS planning criteria for one or more of the following resource concerns:

- Inefficient energy use by equipment and facilities.
- Inefficient energy use in field operations.

The DIA will meet the state adopted NRCS CPS and SOW design section included in the participant's conservation plan or EQIP Contract and include at least one of following:

- Energy Efficient Agricultural Operation (Code 374).
- Energy Efficient Lighting System (Code 670).
- Energy Efficient Building Envelope (Code 672).
- Combustion System Improvement (Code 372).
- Pumping Plant (Code 533).

Final designs will include all energy related NRCS conservation practices and/or NRCS financial assistance payment schedule scenarios used to determine the payment scenario for this DIA.

Preliminary Designs

- 1) Review and update, when needed, results from an NRCS approved assessment or tool used to evaluate energy conservation opportunities and the participant's conservation plan.
 - a) Determine performance characteristics of existing equipment and systems affected by recommendations. For example, if a recommendation is to modify barn lights, include performance characteristics such as system load, light levels, and operating schedule of existing barn lights.
 - b) Determine basis of existing equipment and system performance data (e.g., field measurement, original equipment manufacturer (OEM) specification, etc.) and describe

- any differences between reported and expected performance attributed to age, operation, maintenance of equipment, or similar factors.
- c) Evaluate rationale for changes in equipment or systems capacity, if any, based on either:
 - i) Participant's needs (e.g., meet integrator performance thresholds, align to recommended industry standards); or
 - ii) To comply with CPS criteria.
 - d) Ensure that energy conservation recommendations will meet CPS criteria and will reduce energy use, improve energy efficiency, or address the energy management concerns of the participant's operation.
- 2) Using the criteria in the applicable state adopted CPS and the participant's needs, develop preliminary design alternatives for each practice and/or scenario contracted in this DIA.
- a) If applicable, provide a variety of different conditions for the same recommendation. For example:
 - i) Operation and maintenance changes of the existing equipment and facilities,
 - ii) Adding equipment or components to reduce energy use or improve energy efficiency,
 - iii) Replacement of existing equipment with more efficient equipment at the same output levels,
 - iv) Replacement of existing equipment with more efficient equipment at increased or decreased output levels, or
 - v) Changing the types of equipment that result in reduced energy use or increased energy efficiency.
 - vi) Additional practices or components required to mitigate operational output.
 - b) Estimate installation cost, in dollars, of each preliminary design alternative. Work includes developing preliminary layouts, determining feasibility of current infrastructure, determining performance specifications of proposed equipment, computing approximate quantities of all components, and estimating costs of equipment, materials, labor, operation, maintenance, permits, certifications, and related items required for installation, start-up, and operation of the system.
 - c) All preliminary design alternatives must be linked to improving energy efficiency. Component alternatives primarily related to increased production (without significant energy efficiency improvements) will not be included.
 - d) Determine the applicable NRCS financial assistance payment schedule scenario, quantity, and payment rates for the implementation of each preliminary design.
- 3) Present each preliminary design alternative to the participant and obtain the participant's selections. Document the selections and date received.

Design Reports

- 1) Perform the following:
 - a) Survey, investigation, and potential layout of all components, materials, infrastructure, and structural considerations for each design, including facilitating practices or components that support the primary equipment or facility modification.
 - b) Compute and analyze items that support and ensure adherence to the CPS criteria and that are needed to develop the plans and specifications.
 - c) Develop an engineer's estimate of each final design, including costs of components, materials, equipment, and labor required for demolition, relocation, installation, disposal, start-up, operation, and maintenance; fees for disposal, permits, and certifications; charges for testing and other quality assurance activities; and all other costs associated with the implementation of each design.
 - d) Determine quality assurance activities that are required during installation to ensure the equipment, materials, and installations meet the design intent, function properly, provide the computed energy savings, and can be certified as meeting the plans and specifications. Document design modifications during installation in the event the practice(s) cannot or is not installed in accordance with the plans and specifications.
 - e) Include other information as required in the SOW, including but not limited to, practice purpose, list of permits, facilitating practices, and required federal, state, or local items that affect safety and other environmental concerns.
 - f) Compute energy savings of each design using an appropriate baseline condition. The results may differ from previous energy audits or assessment tools as the baseline conditions may be different due to changes in the operation or the future condition may be different due to changes in output levels.
 - i) Include assumptions made, calculations or methodologies used, and supporting references or information for energy savings or efficiency results.
 - ii) Include sufficient documentation to allow a third party to understand and evaluate the energy savings.
 - iii) Determine the estimated energy savings of each design, first in common sale units (kWh, gallons, etc.) and then converted to energy units of millions of British thermal units (MMBtu).
 - g) Present the results of energy savings using Table 1 with the headings shown as a guide. If energy efficiency improvements for one design require the implementation of a second design, indicate this in the table by using a single line.
 - h) Determine the estimated annual reduction of emissions for each design.
 - i) NRCS has developed a Quick Energy calculator that can be used. The tool estimates air emission effects due to energy savings for fuels and electricity into atmospheric emission reductions. The tool relies on the US Energy Information Administration state-level aggregated emission factors for electricity, liquid, and gaseous fuels to generate estimates of emission savings. The Weblink to the tool, NRCS COMET Quick Energy Calculator, is located at <https://comet-farm.com/quick-energy>. If other methods are used, provide supporting documentation and references.
 - ii) Present the results using Table 2 with the headings shown as a guide.

Table 1. Summary of Energy Efficiency Improvements

NRCS CPS and scenario	Estimated Annual Reduction in Energy Use				
	Electric Savings (kWh)	Natural Gas Savings (ccf) ¹	Propane Savings (gal)	Other ²	Energy Savings (MMBTU)
Totals					

- 1) Unit of purchase.
- 2) Use the *Other* column to aggregate any miscellaneous sources of energy.

Table 2: Estimated Annual Reduction of Emissions

NRCS CPS and scenario	Environmental Benefits ¹					
	Energy Savings (MMBtu)	Greenhouse Gases ²			Air Pollutant Co-Benefits ²	
		Estimated CO ₂ (lbs.)	Estimated N ₂ O (lbs.)	Estimated CH ₄ (lbs.)	Estimated SO ₂ (lbs.)	Estimated NO _x (lbs.)
Totals						

- 1) Environmental Benefits values may be calculated from <https://comet-farm.com/quick-energy>
- 2) CO₂ is a green-house gas; SO₂ and NO_x are ambient air contaminants.

DELIVERABLES

The TSP prepares all the following items to fulfill this DIA's requirements:

Cover Page

The cover page must include the following:

- 1) DIA name and number.
- 2) Participant information: Name, farm bill program name, contract number (TSP obtains contract number from participant), land identification (e.g., state, county, farm, and tract number).
- 3) TSP name, TSP number, TSP expiration date, mailing address, phone number, email address.
- 4) Farm identification:
 - a) Farm name, owner name, street address, and county/state.
 - b) Primary phone number of the participant.
 - c) List of all practice and/or scenario designs included in this plan.
- 5) A statement by the TSP that services meet the DIA requirements, such as:

I certify the work completed and delivered for this DIA:

- *Complies with all applicable Federal, State, tribal, and local laws and regulations.*
- *Meets the General and Technical Requirements for this DIA.*
- *The planned practices are based on NRCS Conservation Practice Standards in the state Field Office Technical Guide where the practices are to be implemented.*
- *Is consistent with and meets the conservation goals and objectives for which the program contract was entered into by the participant.*
- *Incorporates alternatives that are both cost effective and appropriate to address the resource issue(s) and participant's objective(s).*

TSP Signature _____ Date _____

- 5) Participant's acceptance statement indicating:

I accept the completed DIA deliverables as thorough and satisfying my objectives.

The plans and specifications adequately represent existing conditions and the selected preliminary design alternatives. I understand and will abide with the operation and maintenance plans.

Participant Signature _____ Date _____

- 6) A designated space for an NRCS reviewer to certify the agency's acceptance of the completed DIA.

NRCS administrative review completion by:

Signature _____ Title _____ Date _____

Notes and Correspondence

- 1) Provide notes, in date-order that:
 - a) Document each interaction with the participant, results of that interaction, and the date of the interaction.
 - b) Document each site visit, its participants, the activity completed in the field, and results of each site visit.
 - c) Provide initials of the note-maker, if more than one person provides the assistance.
- 2) Provide copies of correspondence between the TSP and the participant relating to decision-making and completion of this DIA. For example, description of alternatives presented for evaluation and decision-making.
- 3) List of all conservation practice names and codes, and payment scenario name, quantity and units included in this plan.

Implementation Maps

Maps for a DIA must include these features:

- a) Map title.
- b) Participant's name.
- c) Assisted By [TSP planner's name].
- d) Name of applicable conservation district, county, and state.
- e) Date prepared.
- f) Map scale.
- g) Information needed to locate the planning area, such as geographic coordinates, public land survey coordinates, etc.
- h) North arrow.
- i) Appropriate map symbols and a map symbol legend on the map or as an attachment.

Design or Implementation Details

This deliverable supports the installation of the designs and will be used by the participant, suppliers, contractors, and NRCS staff to assure quality and sound installation of all components of the practice(s).

Print or electronically save these files separately from the remainder of the deliverable package, if requested.

The written plans and specifications will be used by the participant and suppliers to procure materials; by the contractor to install all components properly; and by NRCS staff to inspect, document, and assure quality installation.

The quality assurance plan will be used by NRCS staff during installation to document written and photographic evidence to support certification of the practice.

The written plans will also be used to document as-built conditions, and modifications to the design, if applicable.

The operation and maintenance plan will be used by the participant after installation is complete.

- 1) Develop site-specific written plans and specifications for each conservation practice design included in the participant's DIA. The plans and specifications must:
 - a) Include, as a minimum, all items listed in each CPS "Plans and Specifications" section and any applicable Practice Specifications (PS).
 - b) Include both graphical and narrative descriptions of the work. Provide descriptive information on the quality of the completed work and the quantities of all materials required for completion of the work.
 - c) A location map, plan view, and written information are required. These items may be included in a single document where all specification information is included on the plans, or in multiple documents where the specifications are independent of the plans.
 - d) Include the following certification on the plans, along with the seal and/or signature of the TSP: "To the best of my professional knowledge, judgment, and belief, these plans meet applicable NRCS standards" as required by Title 210, NEM, Part 505, "Non-NRCS Engineering Services, Subpart B, Section 505.10(3).
- 2) Prepare an operation and maintenance plan for each design that the participant will use after implementation of the designs are complete.
 - a) Include, as a minimum, all items listed in each CPS "Operation and Maintenance" section.
 - b) Include requirements to obtain all applicable manufacturer installation guides, user manuals, and warranty information.
- 3) Prepare a quality assurance plan that includes items to be checked during installation, including photographic documentation required during installation.

Supporting Documentation

Provide results of design tools, resource assessments, or other analyses that are required to meet the Criteria in the state's CPS and PS.

- 1) Include documentation associated with all tasks listed in Preliminary Designs.
- 2) Include documentation associated with all tasks listed in Design Reports.

Deliver Completed Work

The TSP must prepare and provide their participant two sets of the items listed in Deliverables.

- 1) The participant must receive, as a minimum:
 - a) Cover Page, with all signatures, either printed or electronic, and
 - b) Design and Implementation Requirements, all items, including:
 - An electronic copy, and
 - Two (2) sets Hardcopy (printed) - the participant will use one (1) set to procure materials and install the practice; the other set will be used by NRCS for inspection and certification of the practice.

2) NRCS office must receive as a minimum:

- a) An electronic copy of all items, and
- b) Hardcopy (printed), of all items in the Design and Implementation Requirements section.

With the participant's consent, the TSP may transmit the Deliverables to the local NRCS Office. NRCS should review the DIA deliverables before acceptance. The participant or TSP can provide printed versions of all items in the Design and Implementation Requirements section.

References

USDA Natural Resources Conservation Service. Field Office Technical Guide.

<https://efotg.sc.egov.usda.gov/#/>

USDA Natural Resources Conservation Service. National Engineering Manual.

<https://directives.sc.egov.usda.gov/landingpage/562f3eed-6a3b-47f7-be16-1a375629cc70>

USDA Natural Resources Conservation Service. National TSP Resources.

<https://www.nrcs.usda.gov/group/144/resources-for-certified-technical-service-providers>

USDA Natural Resources Conservation Service. National TSP Website.

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/tsp/>