



DESIGN AND IMPLEMENTATION ACTIVITY

Agricultural Energy Design

DEFINITION

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

CRITERIA

General Requirements

A Design and Implementation Activity (DIA) is the planning and designing of a single practice or any combination of structural, vegetative, or land management practices, enhancements, and management activities to treat one or more resource concerns.

The DIA documents the verification of the client's conservation plan, and the development of the implementation requirements or plans and specifications for each planned conservation practice and enhancement.

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 steps in the NEM include:

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

The TSP will maintain an ongoing record of DIA related discussions with the client. The TSP will document on a conservation assistance notes form (CPA-6) or other format that includes all components of the CPA-6 (client objectives, dates of assistance, all parties present, notes of significant information, alternatives considered, and decisions reached). Include correspondence between the TSP and the client related to the development of the DIA.

The TSP may use any of the Conservation Practice Documents, such as job sheets, templates, standard detail drawings, etc. located in the state's Field Office Technical Guide.

This activity 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 client's objective to improve on-farm energy efficiency.

The activity will meet the Natural Resource Conservation Service (NRCS) planning criteria for one or more of the following resource concerns:

Energy efficiency of equipment and facilities

Energy efficiency of field operations

The activity will meet the state adopted NRCS Conservation Practice Standards (CPS) and Statements of Work (SOW) design section included in the client's conservation plan or EQIP Contract and include at least one of following:

Farmstead Energy Improvement (Code 374)

Energy Efficient Lighting System (Code 670)

Energy Efficient Building Envelope (Code 672)

Combustion System Improvement (Code 372)

Pumping Plant (Code 533)

Technical Requirements

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.

1. Preliminary Designs

Perform the following tasks:

- a. Review and update, when needed, results from a NRCS approved assessment or tool used to evaluate energy conservation opportunities and the client's conservation plan.
 - i. 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.
 - ii. 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.
 - iii. Evaluate rationale for changes in equipment or systems capacity, if any, based on either:
 - client's needs (e.g., meet integrator performance thresholds, align to recommended industry standards); or
 - to comply with CPS criteria.
 - iv. Energy conservation recommendations will meet CPS criteria and will reduce energy use, improve energy efficiency and/or address the energy management concerns of the client's operation.
- b. Using the criteria in the applicable CPS and the client's needs, develop preliminary design alternatives for each practice and/or scenario contracted in this DIA.
 - i. If applicable, provide a variety of different conditions for the same recommendation. For example:

- Operation and maintenance changes of the existing equipment and facilities,
 - Adding equipment or components to reduce energy use or improve energy efficiency,
 - Replacement of existing equipment with more efficient equipment at the same output levels,
 - Replacement of existing equipment with more efficient equipment at increased or decreased output levels, or
 - Changing the types of equipment that result in reduced energy use or increased energy efficiency.
 - Additional practices or components required to mitigate operational output.
- ii. 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, permits, certifications, and related items required for installation and start-up of the system.
 - iii. 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.
 - iv. Determine the applicable NRCS financial assistance payment schedule scenario, quantity, and payment rates for the implementation of each preliminary design.
- c. Present each preliminary design alternative to the client and obtain the client's selections. Document the selections and date received in the report.

2. Design Reports

Perform the following tasks, as appropriate:

- a. Surveys, investigations and layouts for all components, materials, infrastructure, and structural considerations for each design, including facilitating practices or components that support the primary equipment or facility modification.
- b. Computations, analysis, and other items that support and ensure adherence to the CPS criteria and are needed to develop the plans and specifications.
- c. Engineer's estimate of each final design, including costs of components, materials, equipment, and labor required for demolition, relocation, installation, disposal and start-up; 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. 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.
- e. 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 changes in the 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 the 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.

Table 1. Summary of Energy Efficiency Improvements

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

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

- 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 <http://cometfarm.nrel.colostate.edu/QuickEnergy>. If other methods are used, provide supporting documentation and references.
 - ii. Present the results using Table 2 as a guide.

Table 2: Estimated Annual Reduction of Emissions

Environmental Benefits ¹						
NRCS CPS and scenario	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 <http://cometfarm.nrel.colostate.edu/QuickEnergy>.
- 2) CO₂ is a green-house gas; SO₂ and NO_x are ambient air contaminants.

3. Plans and Specifications

Develop written plans and specifications for each design.

- a. Include, as a minimum, all items listed in each CPS “Plans and Specifications” section and the SOW “Design” section.
- 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 a quality assurance plan that includes items to be checked during installation, including photographic documentation required during installation,
- e. 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.”

4. Operation and Maintenance Plans

Prepare an operation and maintenance plan for each design that the client 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.

Definitions

Conservation Practice Standard – A CPS is a document that establishes the minimum level of acceptable quality for designing, installing, operating, and maintaining conservation practices. ([Title 450, General Manual, “Technology”, Part 401, Subpart A, Section 401.3C\(4\)](#)).

Statement of Work – A SOW for a CPS is a checklist of the minimum requirements (deliverables) for each step of the process to implement each conservation practice, including design, installation, checkout, and certification. ([450-GM-401.3C\(4\)](#)).

DELIVERABLES

Two copies (hardcopy or electronic) of the DIA must be developed—one for the client and one for the NRCS field office. At the client's request, Technical Service Provider (TSP) can deliver NRCS's copy to the NRCS Field Office. The client's copy must include the plans, specifications, operation and maintenance and quality assurance plans, unless the client requests other documents. The NRCS copy must include all items identified herein. An additional electronic copy of the plan should also be uploaded on NRCS Registry.

1. Cover Page

a) Farm identification:

- (1) Farm name, owner name, street address, and county/state.
- (2) Primary phone number of the client.
- (3) List of all practice and/or scenario designs included in this plan.

b) TSP identification:

- (1) Name, mailing address, email, primary phone number and TSP number.
- (2) Names and credentials of all persons that perform substantive work.
- (3) TSP Certification statement: A statement that the TSP services provided:
 - (i) comply with all applicable Federal, State, Tribal, and local laws and requirements,
 - (ii) meet applicable NRCS standards, specifications, and program requirements,
 - (iii) are consistent with the conservation program goals and objectives, and
 - (iv) incorporate alternatives that are both cost effective and appropriate to address the resource issues.
- (4) Signature of the TSP and date of signature.

c) Client acceptance statement:

- (1) A statement that the plans and specifications adequately represent existing conditions and the selected preliminary design alternatives, and the client understands and will abide with the operation and maintenance plans.
- (2) Signature of the client and date the client received the plans.

d) Block for NRCS reviewer acceptance (to be completed by NRCS).

2. Conservation Assistance Notes and Correspondence

a) Conservation Assistance Notes (NRCS-CPA-6) or other format that includes all components of the CPA-6.

- (1) Document the client's objectives.
- (2) Document each interaction with the client, include notes and results of that interaction, date, and initials of the TSP.
- (3) Document each site visit, activity in the field, results of each site visit, all parties present, date, and initials of the TSP.

- b) Include all correspondence between the TSP and the client relating to the development of the DIA.

3. Maps

- a) General location map of the implementation areas showing access roads to the location. At a minimum, the map will include:
 - (1) Title block showing:
 - (i) Map title.
 - (ii) Client's name (individual or business).
 - (iii) Prepared with assistance from USDA – NRCS
 - (iv) Assisted By [TSP planner's name].
 - (v) Name of applicable conservation district, county, and State.
 - (vi) Date prepared.
 - (2) Map scale.
 - (3) Information needed to locate the implementation area, such as geographic coordinates, public land survey coordinates, etc.
 - (4) North arrow.
 - (5) Appropriate map symbols and a map symbol legend on the map or as an attachment.

4. Preliminary Designs

Include all documentation associated with Technical Criteria section 1) Preliminary Designs.

5. Design Reports

Include all documentation associated with Technical Criteria section 2) Design Reports.

6. Plans and Specifications

Include all documentation associated with Technical Criteria sections 3) Plans and Specifications and 4) Operation and Maintenance Plans.

REFERENCES

USDA Natural Resources Conservation Service. Field Office Technical Guide.

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

USDA Natural Resources Conservation Service. National TSP Website.

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

USDA Natural Resources Conservation Service. National TSP Resources.

<https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/technical/tsp/?cid=nrcseprd1417414>