

## Rural Energy for America Program for Promoting Poultry Farm Energy Efficiency

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The Rural Energy for America Program (REAP) is a U.S. Department of Agriculture (USDA) initiative that offers financial assistance to help agricultural producers and rural small businesses improve energy efficiency and adopt renewable energy systems. One specific part of this program focuses on Energy Audit & Renewable Energy Development Assistance Grants, referred to simply as REAP energy audits, which help identify energy-saving opportunities and support planning for energy projects. REAP energy audit grants provide funding to conduct energy audits or assessments and offer technical assistance for energy planning and renewable energy site evaluations. These audits help businesses and producers understand their current energy use, identify potential improvements, and plan cost-effective efficiency upgrades or renewable energy installations. Poultry farms are strong candidates for REAP funding because poultry houses can be significant sources of carbon emissions, particularly from heating and ventilation systems that rely on fossil fuels and electricity. Improving energy efficiency in these facilities is a key strategy for reducing their overall carbon footprint and lowering associated energy costs. Chai et al. (2012) did two years of ventilation monitoring for two commercial size laying hens (250,000 hens each house with 88 exhaust fans; **Figure 1**) and found that ventilation energy efficiency demonstrated a significant difference between chicken houses with different conditions of fans. The two houses had very similar annual average house inventories and indoor temperatures during the two-year study. However, House A had only 75% of the house static pressure difference (Ps) compared with House B throughout the study. Under the lower absolute Ps, all the variable-speed fans in House A only ran at an average of 83% (Fans north and south 1 and 10) and 85% (the remaining variable speed fans) of fan rotational speed (FRS) compared with House B, while producing similar airflow rates as House B (**Table 1**). According to the third fan law, the fan brake horsepower is proportional to the cube of FRS. Therefore, house B had decreased ventilation energy efficiency and consumed more electricity to achieve similar house ventilation as in house A. This study proved that even for apparently identical layer houses, ventilation control could be considerably different. It demonstrated potential for increasing ventilation energy efficiency in layer houses by carefully managing the ventilation system. More investigations in the future on energy consumption and ventilation efficiency, including in-house airflow patterns, thermal comfort, and air quality, could help producers to enhance layer house environments, increase egg production, improve animal welfare, and reduce carbon footprints.



Figure 1. Poultry house ventilation system.

Table 1: Two-year average daily mean and standard deviation of house inventory, environmental condition, and ventilation. (Chai et al., 2012).

	House A [a]	House B [a]	House A : House B (%)
Hen inventory (head)	250,100(10,249)	246,400(5,011)	101.5
Full house day (n) [b]	731	710	103.0
Hen weight (kg)	1.42(0.05)	1.41(0.08)	100.7
Indoor temperature (°C)	26.8(2)	26.5(2.5)	101.1
Differential static pressure (Pa)	-36.5(9.7)	-48.9(10)	74.6
Fans 1 and 10 FRS (rpm)	424(64)	511(76)	83.0
Fans 21, 25, 28, 31, and 33 FRS (rpm)	502(61)	590(46)	84.9
House ventilation ( $\text{m}^3 \text{s}^{-1}$ )	144.5(107.0)	142.4(104.1)	101.5
Complete data day (n) [c]	693	699	99.1
House ventilation per hen ( $\text{m}^3 \text{h}^{-1} \text{hen}^{-1}$ )	2.08(1.53)	2.10(1.55)	99.0
Complete data day (n) [c]	693	678	102.4

Note: [a] Number in () is standard deviation. [b] Full house day was the day when the house was filled with hens. [c] Complete data day contained valid data that covered >75% of time during the day.

In summary, common factors affecting exhaust fan performance in poultry houses include:

**Fan Mechanical Conditions:** Fan performance directly affects ventilation rate, indoor air quality, and electricity use.

- **Motor and belt inspection:**  
Worn belts, loose tension, misalignment, or motor malfunctions reduce fan speed and airflow while increasing energy consumption.
- **Bearing condition:**  
Worn bearings increase resistance and reduce efficiency.
- **Belt slippage:**  
Even slight slippage can significantly reduce airflow without obvious visual signs.

Regular maintenance ensures fans operate at their rated capacity and prevents unnecessary energy waste.

**Dust Accumulation:** Dust buildup is a major issue in poultry houses.

- Dust on fan blades reduces aerodynamic efficiency.
- Accumulated dust increases motor load and electricity use.
- Heavy buildup can significantly decrease airflow capacity.

Routine cleaning of fan blades, shutters, and guards improves ventilation efficiency and reduces operating costs.

For broken or low-efficiency fans, poultry farms may apply for USDA REAP grants to help offset the cost of repairing or replacing equipment with more energy-efficient systems.

### **Who Can Apply for REAP grant?**

Eligible applicants for the energy audit and renewable energy development assistance portion of REAP include:

- State and local governments
- Federally recognized tribes
- Land-grant colleges and universities or other institutions of higher education
- Rural electric cooperatives and public power entities
- Resource Conservation and Development Councils

The *assistance* provided (energy audits and planning) must benefit agricultural producers and rural small businesses — rural areas generally have populations under 50,000, though agricultural producers can qualify even if located outside rural boundaries.

### **What Can Funding Be Used For?**

REAP energy audit grants may cover costs directly associated with conducting energy audits and providing related technical assistance. Typical eligible uses include:

- Salaries and travel expenses for audit staff
- Office and administrative supplies related to the project
- Renewable energy site assessments and technical energy planning

These grants cannot be used for construction, equipment purchases, or debt payments.

### **Funding Limits and Requirements:**

- Maximum grant amount: Up to \$100,000 per fiscal year for energy audit and renewable energy development assistance combined.
- Applicants generally must submit separate applications for energy audits and other REAP assistance in the same year.

For energy efficiency improvement and renewable energy system projects (the broader REAP grants beyond audits), applicants typically must include the results of an energy audit or assessment that demonstrates energy savings potential.

### **How to Apply for REAP grant?**

Applications for REAP energy audit grants are accepted year-round at local USDA Rural Development offices. Applicants should review current program details, application forms, and deadlines on the official USDA REAP site and consult with their State Rural Development Energy Coordinator for assistance.

## 1. Eligibility

Before you apply, confirm you qualify as a rural small business or agricultural producer and that your project fits REAP requirements (renewable energy systems or energy efficiency improvements).

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## 2. Get Required Registrations

You must have these before submitting a grant application:

- USDA eAuthentication account — This lets you access USDA online systems.
  - System for Award Management (SAM) registration — Required for all federal grants; you'll get a Unique Entity ID (UEI). Registration can take time, so start early.
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## 3. Prepare Application Materials

Most REAP applications require the following (depending on project type):

### Common Required Items

- Completed REAP application form (often Form RD 400-1 and program-specific exhibits)
- Project narrative describing goals and benefits
- Detailed budget & cost quotes
- Documentation of matching funds (REAP grants require applicant cost share)
- Site ownership or control documentation
- Environmental review information (basic checklist initial info)
- Energy audit report (required for energy efficiency projects)

Tip: Contact your State Rural Development Energy Coordinator early — they can help clarify what documents you need.

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## 4. Submit the Application

You have three common ways to submit it:

1. Mail or email to your USDA Rural Development State Office
2. Submit through Grants.gov (if the opportunity is posted there)
3. Use USDA's online e-Grant or RD Apply system (if available for the current cycle)

Submission details, forms, and deadlines are available under the "To Apply" tab on the REAP program page on the USDA Rural Development website.

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## 5. Watch Funding Cycles & Deadlines

REAP operates in funding cycles (often quarterly) with set deadlines for complete applications. Even if applications are accepted year-round, only complete ones by the cycle deadline compete for funds.

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## 6. Application Review

Once submitted, USDA reviews your application to ensure it's complete and eligible. Complete applications enter a competitive scoring process. Projects are scored on energy savings, environmental benefits, matching funds, and other criteria described in the Federal Register Notice.

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## 7. After Submission

If your application is accepted and funded:

- USDA will notify you of the award.
  - You may incur project costs only after submitting a complete application (or risk ineligibility).
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#### 8. Find Forms & Contact Help

- Go to the USDA REAP “To Apply” page for current application packets and Federal Register notices.
  - Contact your State Rural Development Energy Coordinator for guidance by state.
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#### 9. Summary Checklist

- Register in SAM + get UEI
  - Set up USDA eAuthentication
  - Gather eligibility and project documents
  - Complete REAP application forms
  - Include energy audit (if required)
  - Submit by the current funding cycle deadline
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#### 10. Practical Tips

- ✓ Do not buy equipment or start construction before submitting a complete application — costs incurred before award may not be eligible.
  - ✓ Contact your State Rural Development Energy Coordinator early — they’re a key resource for navigating the application process.
  - ✓ If your application isn’t funded in one cycle, it may automatically compete in the next until the fiscal year ends.
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#### References:

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**USDA RD – REAP Program:** <https://www.rd.usda.gov/programs-services/energy-programs/rural-energy-america-program-renewable-energy-systems-energy-efficiency-improvement-grants>

**Acknowledgement: This project is funded by USDA Rural Development REAP Energy Audit Project (0348-0004).**