



U.S. Department of Energy

Categorical Exclusion Determination Form

Program or Field Office: Advanced Research Projects Agency - Energy (ARPA-E)

Project Title: 25A4975 -High Biomass, Low Input Dedicated Energy Crops to Enable a Full-Scale Bioenergy Industry

Location: * - Multiple States - Texas, California, Arizona, Tennessee

Proposed Action or Project Description:

American Recovery and Reinvestment Act:

Dedicated Energy Crops (DECs) with very high yields and low input requirements will transform the bioenergy sector. They will enable reliable, full-scale feedstock supplies to displace oil and coal for biofuel and biopower production, respectively and be produced from less land, lower quality land, and at lower cost than standard varieties. Reducing nitrogen fertilizer inputs would be further transformative because it will reduce N₂O, NO_x, and other GHG emissions, increase life cycle energy ratios, reduce run-offs and water pollution, and drive production costs down even further. Ceres has discovered several genes that significantly increase biomass accumulation and reduce nitrogen requirements by transforming and evaluating switchgrass, rice, and Arabidopsis plants with genes that control nitrogen uptake, assimilation and storage, Switchgrass plants harboring these genes and grown in a greenhouse exhibit biomass increases during nitrogen sufficiency of up to ~40%, and preserve biomass yield in nitrogen-deficit conditions equivalent to reductions in fertilizer application of ~40%. Now, with appropriate permits, these same plants are being tested in replicated field trials in Texas and Arizona. Since these genes increase biomass in all the species tested so far, it is highly likely that these traits will be observed in sorghum and Miscanthus, C4 plants that are close relatives of switchgrass. Such high-biomass switchgrass, sorghum and ~~Miscanthus plants could be adapted to all the locations in the US that are available, or which will become available, for the cultivation of DECs to~~

Categorical Exclusion(s) Applied:

X - B3.6 Siting/construction/operation/decommissioning of facilities for bench-scale research, conventional laboratory operations, small-scale research and development and pilot projects

X - B3.8 Outdoor ecological/environmental research in small area

**please see "comments" section below

*-For the complete DOE National Environmental Policy Act regulations regarding categorical exclusions, see Subpart D of 10 CFR10 21 [Click Here](#)

This action would not: threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, including DOE and/or Executive Orders; require siting, construction, or major expansion of waste storage, disposal, recovery, or treatment facilities, but may include such categorically excluded facilities; disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; or adversely affect environmentally sensitive resources (including but not limited to those listed in paragraph B.(4)) of Appendix B to Subpart D of 10 CFR 1021). Furthermore, there are no extraordinary circumstances related to this action that may affect the significance of the environmental effects of the action; this action is not "connected" to other actions with potentially significant impacts, is not related to other proposed actions with cumulatively significant impacts, and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211.

Based on my review of information conveyed to me and in my possession (or attached) concerning the proposed action, as NEPA Compliance Officer (as authorized under DOE Order 451.1B), I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

NEPA Compliance Officer: /s/ William J. Bierbower

Digitally signed by William J. Bierbower
 DN: cn=William J. Bierbower, o, ou,
 email=william.bierbower@hq.doe.gov, c=US
 Date: 2010.01.15 15:04:41 -05'00'

Date Determined: 01/15/2010

Comments:

Webmaster:

"This categorical exclusion determination applies to the proposed award effort, except any field trials other than Arizona and Texas. The awardee has already received a USDA permit -- copy of page one of permit attached - for field trial sites in Arizona and Texas, and that permit was subject to a NEPA determination by USDA. For the the proposed field trials to be conducted in Tennessee, Florida or any other new sites, a separate ARPA-E categorical exclusion determination must first be obtained from ARPA-E, and that determination will be subject to Ceres first obtaining a USDA permit that has received a similar NEPA review. The Cooperative Agreement will reflect this requirement and note that any funding for the field trials in Tennessee, Florida, or other new sites will not be provided to Ceres until the second ARPA-E categorical exclusion determination is provided."



Miscanthus plants could be adapted to all the locations in the US that are available, or which will become available, for the cultivation of DECs to serve the biofuel and biopower industries. They could therefore provide low-cost, stable, and sustainable feedstocks sufficient to sustain the bioenergy industry for the foreseeable future. Working towards this extremely important goal, this research program proposes to produce and field-test such high-biomass switchgrass, sorghum and Miscanthus plants in a diverse set of field environments across the US. High-biomass energy crops are highly valuable not only as feedstocks, but also as carbon sinks, the perennial species with large and extensive root systems are carbon-negative when grown and managed in accordance with relevant tilling, planting and harvesting programs. This research program will quantify and better understand the magnitude of these sinks by measuring the biomass and carbon content, and by modeling and comparing the CO₂ sequestration in the shoots and roots of the switchgrass, sorghum and Miscanthus plants bearing the high biomass, low input genes. Also, since the genes under investigation affect nitrogen uptake, assimilation and storage, it is likely that these plants use nitrogen fertilizer more efficiently. This will be quantified by monitoring the nitrogen levels in the soil and in the plants, and by modeling and comparing it in the switchgrass, sorghum and Miscanthus plants. If the plants are indeed more nitrogen-efficient in the field, they will allow fertilizer applications to be lowered and NO_x emissions to be reduced without loss of biomass. Finally, these findings will be drawn together in a set of projections for how these genes will bring value when applied on a commercial scale. In summary, the objectives of the research program are four-fold: 1) Introduce four genes affecting nitrogen use efficiency into switchgrass, sorghum and Miscanthus plants; 2) Determine the effects of these genes on biomass gain, fertilizer use, carbon sequestration, and fertilizer requirements; 3) Use these results to model GHG projections for our plants on a commercial scale; and 4) Describe how these high-biomass and nitrogen-efficient transgenic switchgrass, sorghum and Miscanthus plants can be commercialized in field environments across the US. Full-scale deployment of this transformational technology in the biofuel and biopower industries from 2020-2030 will be market-driven by reduced costs, and result in conservation of 1.26 B barrels of oil, 58 M tons of coal, 1.2 M tons of nitrogen fertilizer, 682 M tons of CO₂, and 82 M lbs of NO_x emissions.