USDA 9003 Program

Technology Success Strategies

August 14, 2015

Sponsored by:

Westar Trade Resources

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Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program

Technical Readiness Success Strategies

August 14, 2015

Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program (9003)

- Interim Final Rule published June 24, 2015 in the Federal
- Notice of Solicitation for Applications published July 6, 2015—rolling six-month application cycles.

9003 Program Purpose

Guaranteed Loans

- Loan guarantees for up to 80% of the total eligible project costs up to $250 million.
- The maximum total Federal participation is 80% of the total eligible project cost.
- The borrower and other principals must make a significant cash equity contribution investment in the project.

Project Eligibility

The development, construction, or retrofitting of a Commercial-Scale Biorefinery using **Eligible Technology**.

Biological, Biochemical, Electrochemical, Thermochemical, hybrids, etc.

Eligible Technology

- A technology that is being adopted in a viable Commercial-Scale operation of a Biorefinery that produces an Advanced Biofuel; or
- A technology that has been demonstrated to have Technical and Economic Performance for commercial application in a Biorefinery that produces an Advanced Biofuel.

What is Advanced Biofuel?

Fuel derived from Renewable Biomass, other than corn kernel starch, to include:

(1) Biofuel derived from cellulose, hemicellulose, or lignin;

(2) Biofuel derived from sugar and starch (other than corn kernel starch),

(3) Biofuel derived from dedicated biofuel crops (e.g. oil seeds, perennial grasses, woody biomass, algae) waste material, including crop residue stover, straw etc.), other vegetative waste material, animal waste, food waste, and yard waste;

(4) Diesel-equivalent fuel derived from Renewable Biomass, including vegetable oil and animal fat;

(5) Biogas (including landfill gas and sewage waste treatment gas) produced through the conversion of organic matter from Renewable Biomass;

(6) Butanol or other alcohols produced through the conversion of organic matter from Renewable Biomass; and

(7) Other fuel derived from cellulosic biomass.

Renewable Biomass

Renewable biomass.

(1) Materials, pre-commercial thinnings, or invasive species from National Forest System land or public lands, or

(2) Any organic matter that is available on a renewable or recurring basis from non-Federal land or land belonging to an Indian or Indian Tribe that is held in trust by the United States including:

(i) Renewable plant material, including feed grains; other agricultural commodities; other plants and trees; and algae; and

(ii) Waste material, including crop residue; other vegetative waste material (including wood waste and wood residues); animal waste and byproducts (including fats, oils, greases, and manure); and food waste and yard waste.

Biorefinery

- Eligible projects must use eligible **technology to produce advanced biofuel (primary and co-products)**
- May also produce:
  - **Renewable chemicals**
  - **Biobased products**
  - May generate electricity
- Production of biofuel from corn kernel starch is ineligible

Biobased Product Manufacturing

Eligible projects:

- Manufacture renewable chemicals and other biobased outputs of biorefineries into end user products
- Use **technologically new equipment and facilities**

Application Process

- Letter of Intent
- Two Application Phases
  - Phase 1
  - Phase 2
- Application Deadlines – Submit at Anytime
  - October 1
  - April 1

Letter of Intent

Due 30 days Prior to Application Due Date

- Borrower, Lender and Project sponsors
- Project Description and Location
- **Proposed feedstock, technologies, and products produced**
- Total Project Cost and Loan Amount Requested
- Expected Application Cycle

Application Phase One

- Application Form
- **Project Summary**
- Financial Statements and Financial Model
- **Feasibility Study**
- Business Plan
- Priority Scoring Information

Application Phase Two

- The timeline to complete phase two will be driven by the borrower.
- Phase two includes: final project planning, **Technical Report**, environmental assessment, final evaluation of economic feasibility and **technical viability**, lender's final analysis and credit evaluation and a credit rating.
- Concludes with establishing loan terms and conditions prior to issuance of the Conditional Commitment

Best Management Practices

Lessons Learned

Feasibility Study

- Economic
- Market
- **Technical**
- Financial
- Management

Technical Report

- Qualifications of project team
- Resource assessment
- Design
- Engineering
- Schedule
- Procurement
- Installation
- Operations
- Management
- Decommissioning

Deal Jeopardy

- Quality of Application – eligibility, adherence to guidelines, & format
- Scoring criteria
- Lender
- Technical Maturity
- Equity
- Credit
- NEPA
- Timeliness

Progression

- Crawl-walk-run-distance-endurance
  - Lab/Bench
  - Pilot
  - Integrated Demonstration
  - First Commercial
  - Commercial Replication

Demonstration Facilities

Internal

- Find a Partner
- Consult with IE

External

- National Labs
  - NREL, PNNL, INL, NETL, Ames, Argonne, Sandia, Brookhaven, Oak Ridge, Livermore etc.
  - Partners: DOE, DoD, NSF, USDA (ARS, NIFA), etc.
  - Testbeds (AZ algae)
  - Incubators
  - Mobile
- State Labs
  - BSEL etc.
  - Universities & Land Grants / Sun Grants, 1890s, HSI, etc.
- Private Labs
  - SWRI, SRI, Hazen, ZeaChem
  - Virent, ICM, Abengoa, POET, Dupont
  - RTI, TRI, WRI, MBI, BP, ADM

Scale

- Appropriate
- Distributed
- Decentralized
- Modular
- Mobile

What is a good description of technical readiness by USDA standards?

- Competitive process
- R&D completed?
- Pilot underway or completed?
- A project that is technically ready is one that has appropriately designed and developed such that a technical feasibility can be conducted by a qualified resource independent of the project and final IDU report submitted and approved by USDA.

- In Phase 1, USDA does not expect the applicant to come in with an IDU already.
- IDU is a requirement of Phase 2 and must be successfully completed and incorporated into final design and engineering criteria consistent with business plan prior to issuance of Loan Note Guarantee.

How is the technical evaluation conducted throughout the USDA evaluation process?

- The National Office receives and reviews applications on a first come/first served basis, as submitted per the respective deadlines. There are teams of professionals that reviews each project to maintain consistency.
- All final financial and technical decisions are made and approved by USDA.

Which USDA program should I be applying for – 9003, 9007, or B&I?

9003

- Program for biorefinery, renewable chemical, and bio-based product manufacturing technologies that are beyond the bench-scale, pilot, and integrated demonstration stages.

9007

- Program for technologies having 1 year or more of proven commercial operation and production.

Business and Industry (B&I)

- Non renewable energy business projects or those that don't meet 9003 & 9007 eligibility criteria.

	Business & Industry (B&I)	Rural Energy for America Program (REAP)
MINIMUM LOAN	No minimum	$5,000
MAXIMUM LOAN	Maximum $25 million and up to $40 million on rural cooperative organizations that process value-added agricultural commodities	$25 million or 75% of total eligible project costs, whichever is less (75% includes grant dollars received under REAP, if applicable)
ELIGIBLE PURPOSES	• Business and industrial acquisitions • Purchase of land, machinery and equipment • Construction, enlargement of modernization • Eligible fees and costs • Educational or training facilities • Tourist facilities • Hotels/motels • Pollution control or abatement • Recreation facilities • Working capital • Refinancing when it is determined that the project is viable and equal or better rates and terms are offered • Commercially available energy projects that produce biomass fuel or biogas. (May include co-digestion of non-renewable feedstocks) • Processing of locally/regionally produced Ag food products • Loans to purchase stock issued by a cooperative organization	Eligible projects are: 1. Installation of renewable energy systems such as solar photovoltaic, solar thermal, wind turbines, anaerobic digesters, biomass/bioenergy, geothermal, hydrogen, ocean energy, and small-hydroelectric 2. Energy efficiency improvements to buildings, equipment, and processes that reduce use of energy such as Heating, Ventilation, and Air Conditioning (HVAC), heat and heat recovery, combined heat and power, cooling/refrigeration, lighting, variable frequency drive or automated control updates, window replacement, motor conversions, insulation, power usage, etc.) Eligible loan purposes include post application costs that are directly related to a commercially available renewable energy system and energy efficiency improvement, including: • Purchase and installation of new or refurbished equipment • Construction, retrofitting, replacement and project improvements • Energy efficiency improvement identified in an energy assessment or energy audit • Fees for construction permits and licenses • Building/Equipment for existing renewable energy system • Refinancing of outstanding debt (subject to conditions) The following purposes cannot exceed more than 5% of the loan amount: • Working capital • Land acquisition • Routine lender fees • Energy Assessments, Energy Audits, technical reports, business plans, and Feasibility studies

INELIGIBLE PURPOSES	• Relocate jobs or to expand a business where an excess of supply of the goods or services already exists • Pay any distribution an owner or beneficiary who will continue in business • Transfer the ownership of a business unless the transfer is necessary to keep the business from closing • Finance inherently religious activities • Finance agricultural production with the exception of specialized crops • Finance golf courses, racetracks and gambling facilities	• Residential projects • Agricultural tillage equipment • Used equipment • Vehicles • Lines of credit • Lease payments • Finance a project if the business operations derive income from activities of a sexual nature, illegal activities, or derive more than 10% of gross revenues from gambling activity • Finance political or lobbying activities • Finance a project that creates a conflict of interest or the appearance of a conflict of interest. • Pay off any Federal direct or guaranteed loans or other Federal debts
ELIGIBLE BORROWERS	Non-profit and for profit entities engaged or proposing to engage in a business that are located in rural area under 50,000 population	• Agricultural producers • Small business located in rural area under 50,000 populations
GUARANTEE PERCENTAGE	• 80% maximum guarantee on loans up to and including $5 million • 70% maximum guarantee on loans greater than $5 million and up to and including $10 million • 60% maximum guarantee loans greater than $10 million	• 85% maximum guarantee on loans $600,000 or less • 80% maximum guarantee on loans more than $600,000 but less than $5 million • 70% maximum guarantee on loans $5 million up to and including $10 million • 60% maximum guarantee loans greater than $10 million
EQUITY	Tangible balance sheet equity requirement: • 10% for existing business • 20% for startup • 25-40% for energy projects • Determined from balance sheets prepared in accordance with Generally Accepted Accounting Principles	Other funding requirement: • 25% of the total project cost • Agricultural Producers can submit financial information in a format that is accepted by Agricultural Lenders
COLLATERAL	• Real estate - 80% of appraisal value • M&E – 60-70% of appraised value • Accounts Receivable/Inventory- 50% of book value	• Real estate - 80% of appraisal value • M&E – 60-70% of appraised value • Accounts Receivable/Inventory- 50% of book value
FEES	Guarantee fee: 3% of the guaranteed portion of the loan payable to USDA Rural Development when the guarantee is issued --- Annual renewal fee: 0.5% • Based on the outstanding balance of the guaranteed portion of the loan as of December 31st.	Guarantee fee: 1% of the guaranteed portion of the loan payable to USDA Rural Development when the guarantee is issued --- Annual renewal fee: 0.25% • Based on the outstanding balance of the guaranteed portion of the loan as of December 31st.
TERMS	• 30 years for real estate • 15 years or useful life of equipment • 7 years for working capital	• 30 years for real estate • 15 years or useful life of equipment • 7 years for working capital

Are there any special or unique considerations for renewable chemicals and bio-products?

- All considerations are the same. Please refer to Rule, Funding Notice, and Guidelines.

Agency Resources

Program web homepage:

www.rd.usda.gov/programs-services/biorefinery-assistance-program

Agency Contact Information:

Email: EnergyDivision@wdc.usda.gov

Telephone: 202.720.0410

Rural Development State Energy Coordinators: http://www.rd.usda.gov/files/RBS_StateEnergyCoordinators.pdf

THANKS

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The Independent Engineer

Goals of a Demonstration Project

Presented by: Bill Crump

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- Leidos (formally R. W. Beck) Since the early 1980's has provided independent engineering services for nearly1,000 power, infrastructure, and industrial projects for more than 150 different financial institutions in 75 countries and territories.
- Provided IE services for renewable fuels and chemicals projects:
  - Over 50 Advanced Biofuel/Chemical Projects (including: Algenol Biofuels, Sapphire Energy, Solazyme, Enerkem, ICM, Abengoa, Mascoma, Flambeau Rivers, Pacific Ethanol, Verenium, RSE, Blue Fire, Range Fuels, POET-DSM, REII, ADM, Logos Technologies, Bioenergy International, Clearfuels-Rentech, ZeaChem, API, Haldor Topsoe, BPA, Mercurius, Frontline, INEOS, Amyris, UOP, Cool Planet, GTI, Coskota, Myriant, Ensyn, Red Rock Biofuel, KIOR, Fulcrum Bioenergy, INEnTec, Sundrop Fuels.)
  - Over 75 Starch to Ethanol Projects (corn, wheat, cassava, milo, molasses)
  - Over 20 Biodiesel and Oligo-Chemicals Projects

Demonstration Plant Goals – equipment design and financial model

- A demonstration plant has the proper equipment selection, integration, and runtime to provide the information needed for the pioneer plant design and development of a reliable financial model.
- Inform the pioneer plant design:
  - Scale-up to pioneer plant (equipment sizing and capital cost estimation);
  - Demonstrate types of equipment, through-put capacities, and materials of construction to be used on pioneer facility;
  - Quantify emissions;
  - Demonstrate ability to reliably operate major processes at capacity (including specific BOP);
  - Demonstrate effects of recycle streams or accumulation of contaminates;

Demonstration Plant Goals – equipment design and financial model

- Inform the financial model:
  - Capital cost estimation, capital reserves, major maintenance accounts
  - Develop an operations plan and identify maintenance needs;
  - Estimate utilities usage (account for heat integration / minimize losses);
  - Quantify consumables (utilities, chemicals, water, catalyst);
  - Demonstrate availability, through-put, yields and qualities
  - Generate sufficient product for product testing

Considerations for demonstration scale

- Main Processes - examples
  - Solids Handling
  - Biological
  - Catalytic Processes
  - Other considerations

Demo Plant Design Considerations – Solids Handling

- Need to demonstrate the ability to dry, process, move, filter, and feed across pressure boundaries with the actual biomass to be used with the pioneer plant and at the expected range of sizes, foreign objects, and moisture contents.
- Types of issues:
  - Trapped dirt and rocks carried in with the feedstock causing fouling, erosion, and breakage.
  - Fines classification.
  - Lignin binding or plating (leaving dryers or in liquid processes).
  - Shear and wall forces impacting the initial torques for conveyors.
  - Forming a pressure seal with dry biomass.
  - Plugging and binding.
- Perform your own due diligence on the expert vendor – confirm their equipment is currently operating using the same material and properties. Talk with the operators at the existing plant.

Demo Plant Design Considerations – Biological Processes

- Longer runtimes are needed to quantify contamination effects. (Fermentation, enzymes, algae ponds, systems of PBRs). Quantify effects by:
  - Running for several seasons in same environment as pioneer plant (biological contamination changes by location, season, and by year).
  - Demonstrating SIP/CIP procedures for many cycles. For parallel systems, include the headers. What is okay in a starch plant may not be okay for cellulosic conversion plants using GMOs.
- Other considerations
  - Pioneer plant may rely upon yeast recycle. Not normally part of the piloting efforts.
  - Aeration scale-up for next generation fermentation products.
  - Biological systems can produce undesirable co-products that hinder product specification compliance.

Demo Plant Design Considerations – Catalyst Testing

- Determine performance, attrition costs, useful life, regeneration frequency, and turn-around times.
- Evaluating catalytic processes are uniquely complicated.
  - Long performance period. Ideally, the catalyst lasts 1 to 5 years with minimal regenerations.
  - Impact of process upsets can be catastrophic.
  - Replenishment of catalyst due to catalyst loss on the small scale may “mask” effects of contaminates.
  - Catalyst performance is dynamic (yield and selectivity changes with time, process conditions, and feed composition).
  - Acceptable performance is not only technical but determined by commercial factors such as (1) cost of catalyst replacement; (2) downtime; and (3) product value.

Demo Plant Design Considerations – Catalyst Testing Cont.

- Need to demonstrate at similar conditions with a commercially provided catalyst (same sized catalyst) in same diameter and length tubes; space velocities; slurry loading; etc (all the primary conditions to be used on pioneer plant).
  - Trend catalyst performance from the testing done in the laboratory; at pilot scale; and from the demonstration scale.
  - Due to the smaller scale needed to prove out catalyst performance – **the pilot scale information may be sufficient** if the syngas is generated from the actual feedstock and equipment with integrated recycles.
  - Commercially proven catalyst may need less actual testing if the syngas is shown to be similar to past experience and the catalyst provider analyzes the catalyst for contamination impacts.
  - If you don't demonstrate your catalyst performance for the life of the catalyst under actual conditions - then mitigate risk with providing capital reserve for more frequent catalyst change-outs in financial model.

Demo Plant Design Considerations

- The actual **capacity** of the demonstration facility is not as important as meeting the goals of informing the pioneer plant design and the financial model.
- Demonstration **run time** is not a set number of hours. It depends on the processes being demonstrated.
- The demonstration facility systems can have different capacity systems.

Demonstration scale facilities – the real “valley of death”

Full

- Greenfield build
- Train 1 of commercial facility

Partial

- 3rd party testing facilities (piloting services or test beds)
- Co-locate with existing facility
- Use of vendor mobile units
- Build the pilot plant with the forethought of what is needed to inform the pioneer plant efforts.

Pilot data sufficient

- Well known parameters for unique process which also uses traditional equipment.

Little appetite from investment community to build non-commercial facilities (stranded capital).

Equity? Debt? Grant? Loan Guarantee? Other?

For More Information

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USDA 9003 Program

Technical Readiness Impact for The Lender and the Application

Cindy Thyfault, Founder and CEO

August 14, 2015

Westar Overview

- Westar has been in business for over 21 years assisting clients to obtain government grant and loan financing.
- Our clients have received over $1.2 billion in financing conditional commitments and final loan closing from USDA, DOE, and ExIm Bank.
- Our clients include most of the 9003 successful applicants since 2009, including Sapphire Energy, Fulcrum, Zeachem, Chemtex, Cool Planet, and Ensyn.
- Cindy Thyfault, CEO, also serves on the Secretary of Commerce's Renewable Energy and Energy Efficiency Advisory Committee, and provides recommendations to promote exports of EERE technologies and products.

Feasibility Study – *Technical Evaluation & Requirements*

(1) Suitability of the selected site for the intended use
(2) Scale of development for which the process technology has been proven
(3) The degree of integration of all processes should be detailed, and a summary of any integrated demonstration unit test results should be submitted.
(4) Specific volume produced from the technology of the process
(5) Identification and estimation of Project operation and development costs.
(6) A projected timeline detailing Borrower plans from the time of loan application through plant construction, commissioning, and ramp up should be included.
(7) Ability of the proposed system to be commercially replicated
(8) Technical Risks

Technical Feasibility Success Strategies

- This is a detailed section and very technically driven process, and to be successful you must follow the format and the rules and regulations of the 9003 program.
- You won't get to Phase 2 without a ***Rock Solid*** Feasibility Study!
- Keep at the forefront that this solicitation is a competitive process, and you have to provide all of this information to be considered.
- It is critically important to have a well-organized appendix with all of the background information, including the IE Report.

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How Does the Technology Development and Feasibility Study Evaluation and Verification Affect:

1. Obtaining a Lender

and

2. Obtaining a 9003 Loan Guarantee?

(Or Why Only Results Count)

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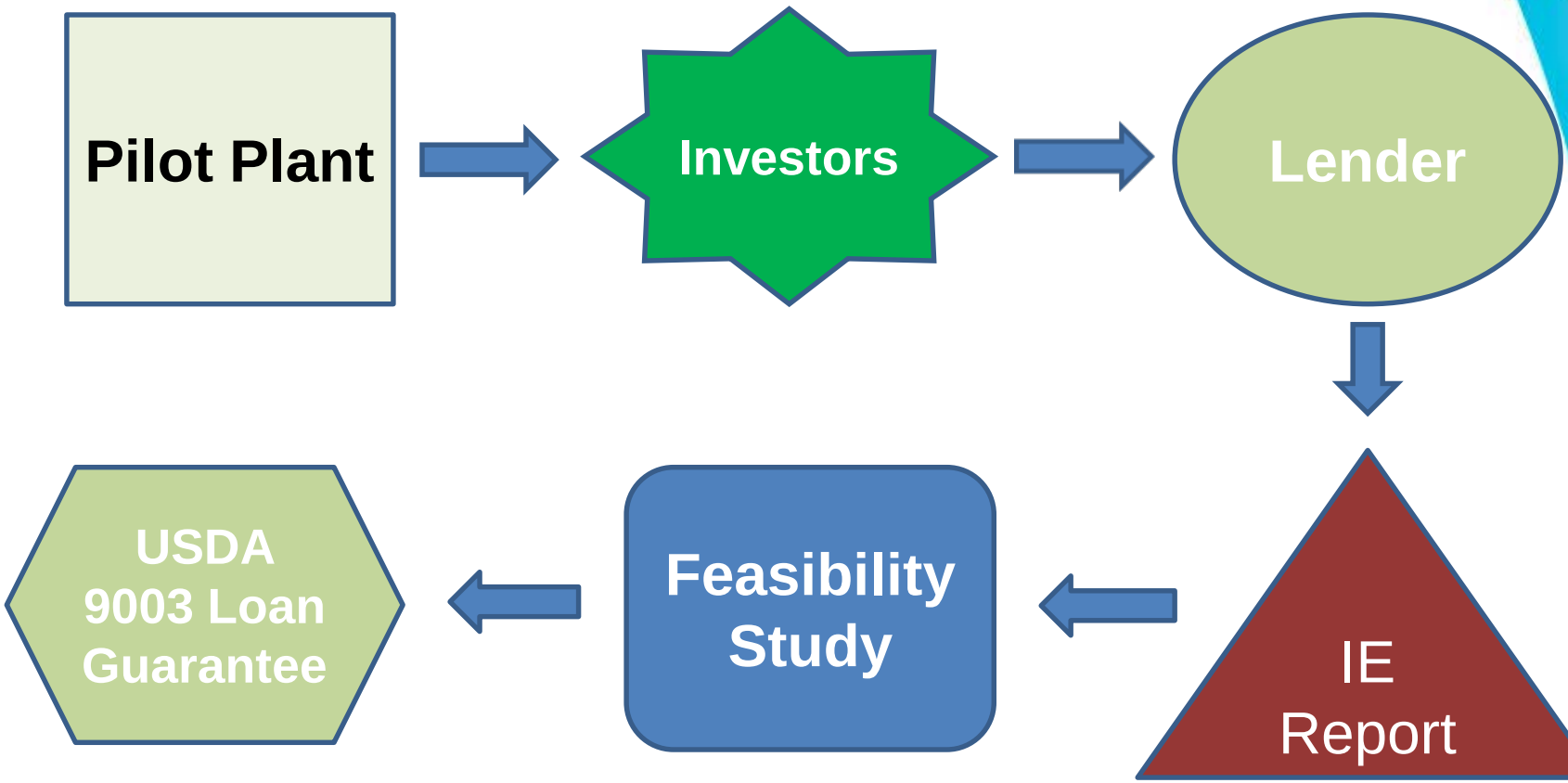
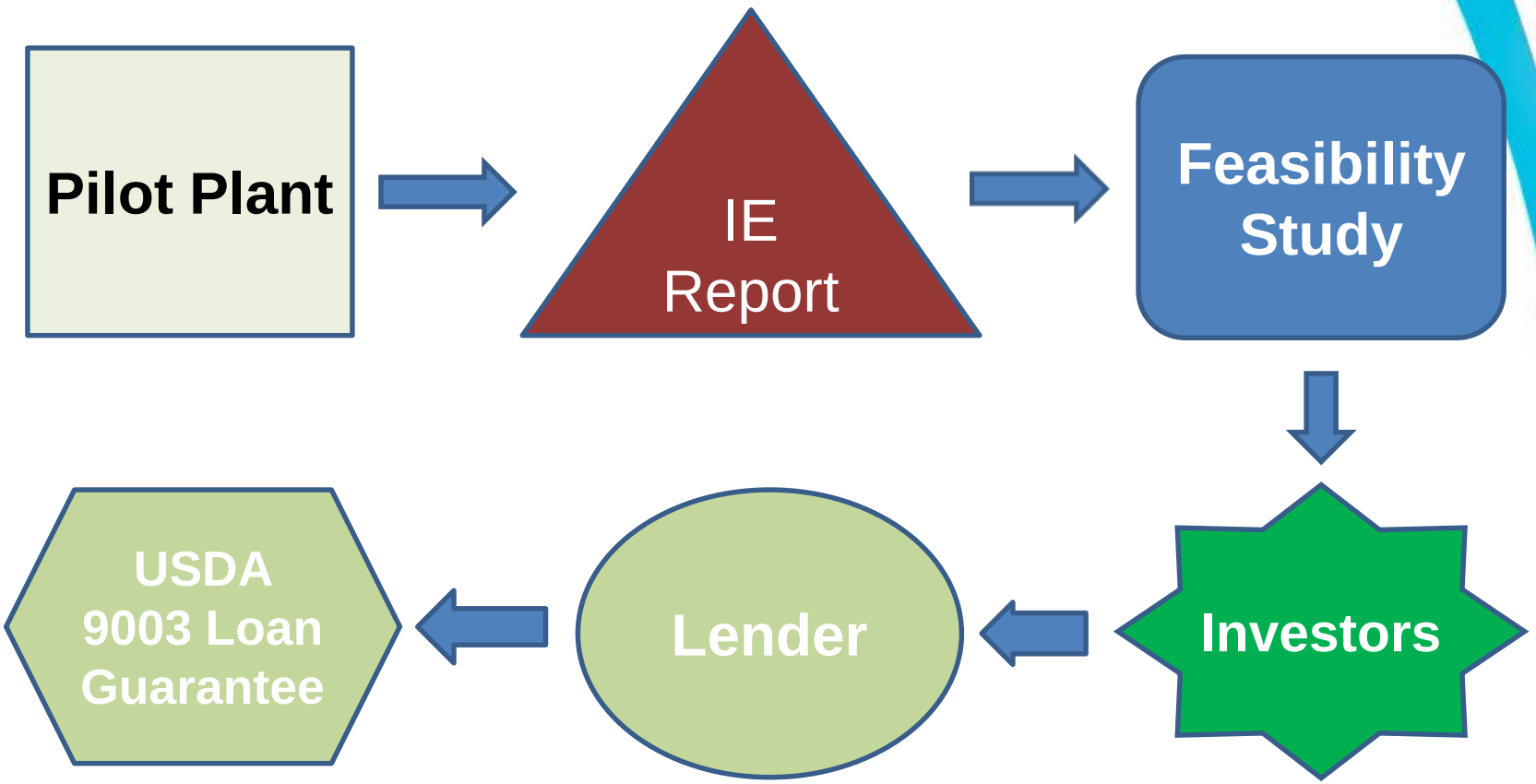
Current Developer Process



Strategic Successful Process



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Questions and Answers