DOE OFFICE OF INDIAN ENERGY

Energy Options Analysis

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U.S. DEPARTMENT OF ENERGY | Office of Indian Energy

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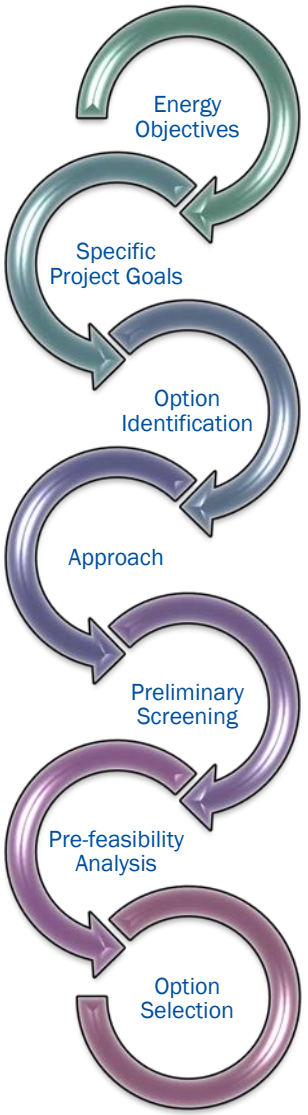
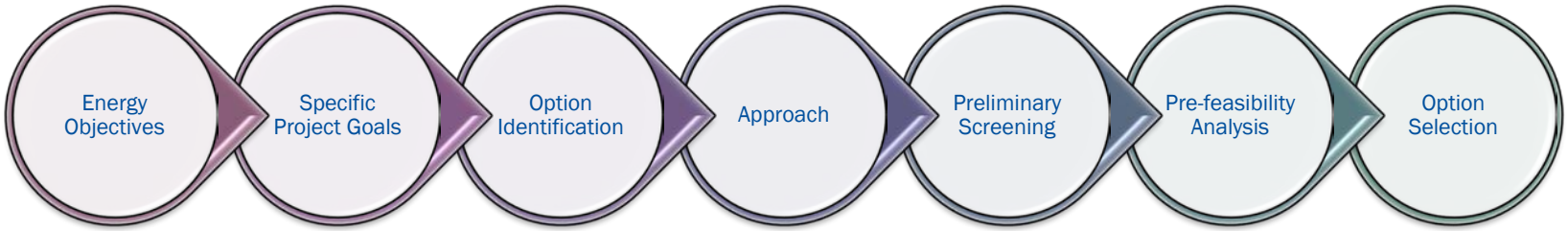
Energy Options Analysis

The most recent DOE Office of Indian Energy Funding Opportunity Announcement (FOA) describes an Energy Options Analysis as,

- "a systematic assessment and evaluation of possible alternative approaches available for achieving specific energy objectives and determining which of the options are the most effective and provides the best solution to achieve those objectives."
- "Such an analysis is intended to explore all feasible technology alternatives (e.g., conventional technologies, renewable technologies, energy efficiency measure(s)) and provide evidence that the proposed project choice can actually be implemented and is the best option available among all feasible alternatives."

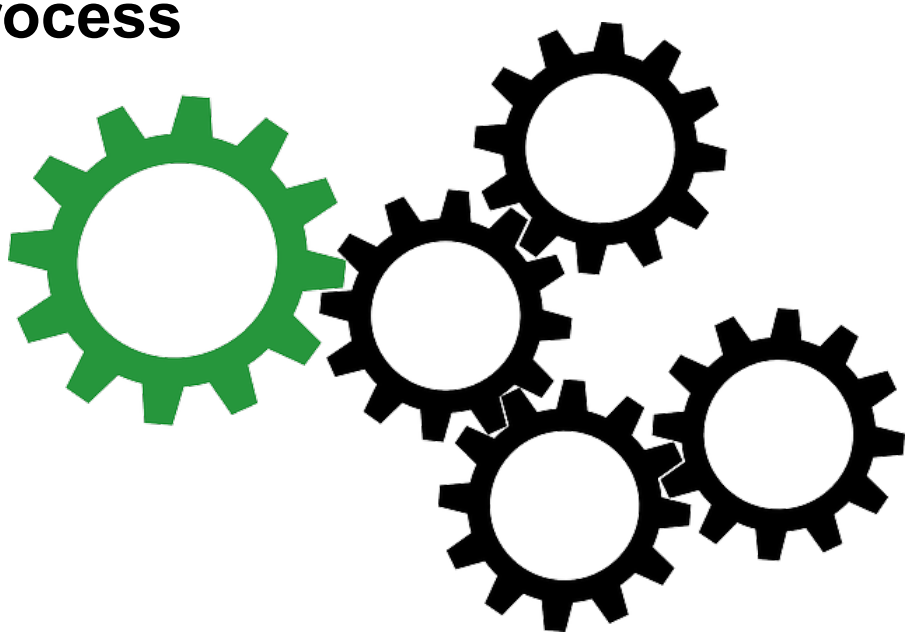


Options Analysis Methodology



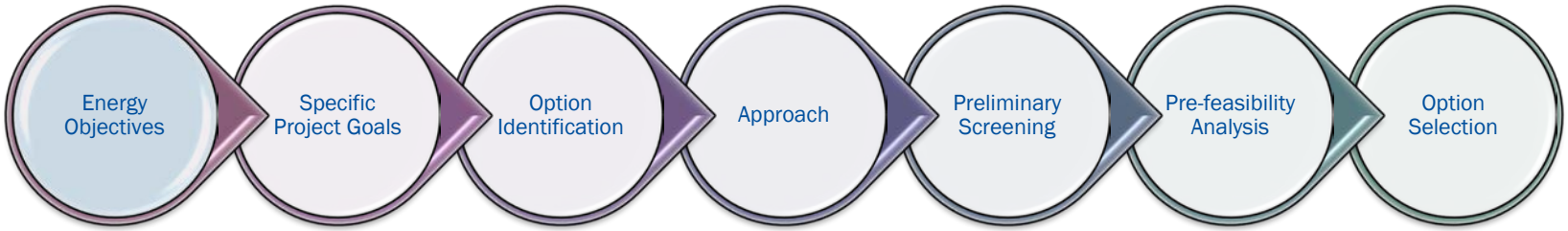
A *concept* not a specific process

- Energy Objectives
- Specific Project Goals
- Option Identification
- Approach
- Preliminary Screening
- Pre-Feasibility Analysis
- Option Selection



Note: the FOA Options Analysis Template can be downloaded at https://eere-exchange.energy.gov/FileContent.aspx?FileID=e7eb273a-5e28-4539-83de-216f2759431a

Energy Objectives

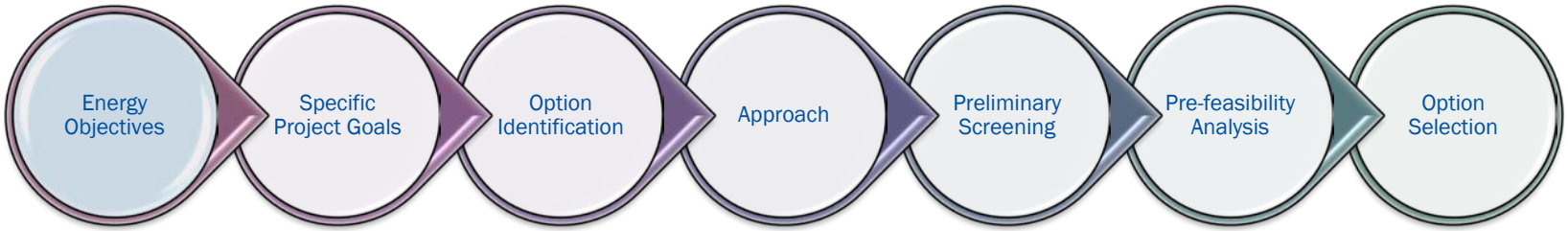


Examples of Primary Objectives:

- **Economic development** is a very high priority for the Tribe given the high poverty and unemployment rates on the reservation. The Tribe needs projects that can generate employment for the members as well as provide training and expertise for high demand jobs.
- Support tribal environmental and **net-zero energy goals** by reducing reliance on non-renewable energy resources and increasing local renewable generation.
- **Minimize life-cycle costs** of energy services compared to historic costs.

NOTE: Examples from actual tribal Energy Option analyses

Energy Objectives

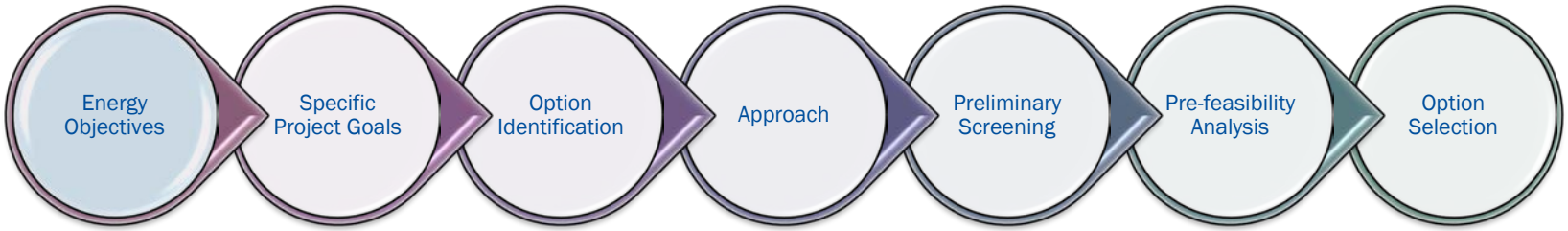


Examples of Primary Objectives:

- **Increase resiliency** by providing autonomous energy service for critical energy loads during utility outages.
- **Align with the long-term vision** of the community: As the Tribe executes its strategic plan, the project must support this vision and enable progress towards it.

NOTE: Examples from actual tribal Energy Option analyses

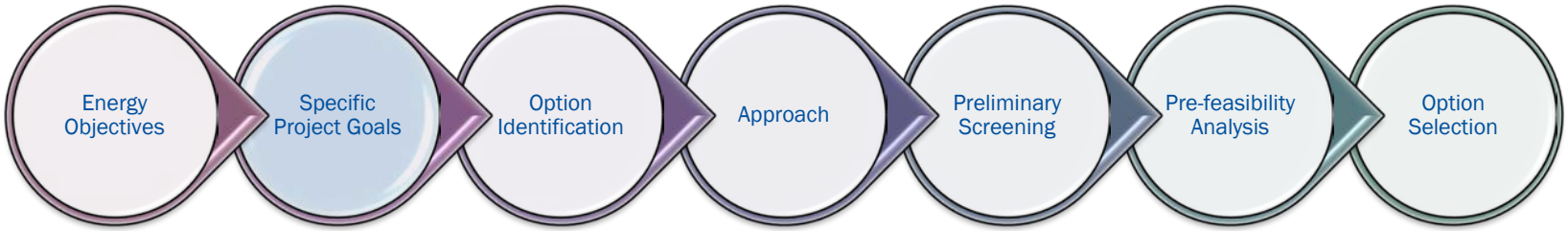
Energy Objectives (continued)



Examples of Secondary Objectives:

- Provide local **workforce development and education opportunities**.
- **Build internal capacity** for operations and maintenance.
- Provide **potential future expansions** to serve additional tribal buildings.

Specific Project Goals



Project goals should define the intended end-result as a quantifiable metric.

Examples might include:

- On-site generation of 1 MW.
- Save 20% of annual energy costs.
- Provide power to critical facilities during an emergency situation.
- Provide peak power for the Tribal Administration building.
- Generate 100% of the power for all tribal community buildings.
- Increase renewable energy penetration by 10%.
- Reduce cost of electricity by $0.03 per kWh.
- Reduce fuel consumption by 30%.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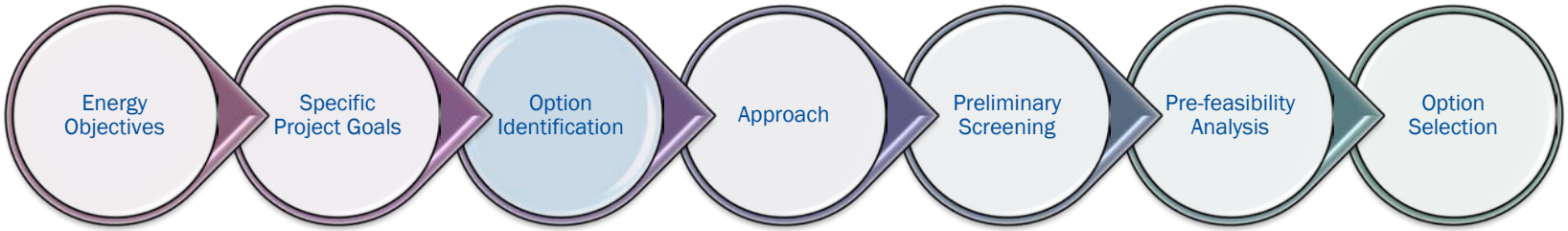
Option Identification

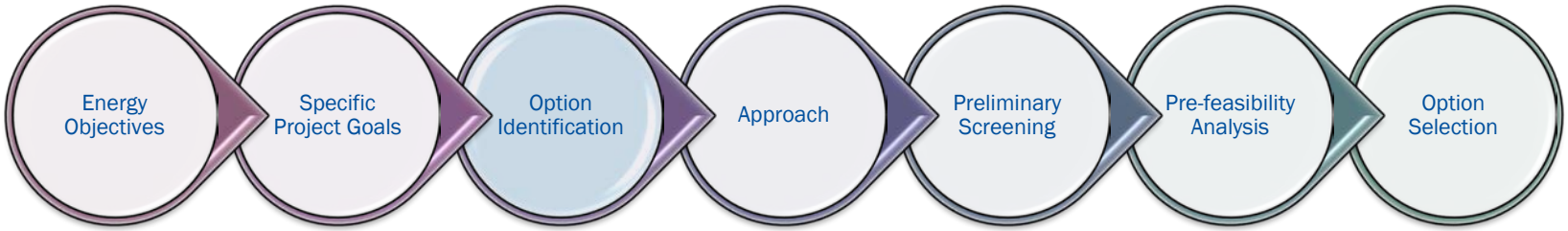


Options should include as a minimum, the baseline "current state" option, the "do-minimum" option(s), and a variety of "do-something" options.

"Current State" Option: The "current state" option (or "do-nothing" option) is evaluated as a bench-mark, to determine whether the other options considered improve or detract from the current situation.

"Do-minimum" Option(s): Define the "do-minimum" option(s) for the project which is a scenario that requires minimum effort and cost. This option assumes incurring certain insignificant investment outlays that go beyond the existing operational and maintenance costs. It is the least cost solution for achieving the overall objectives or requirements.

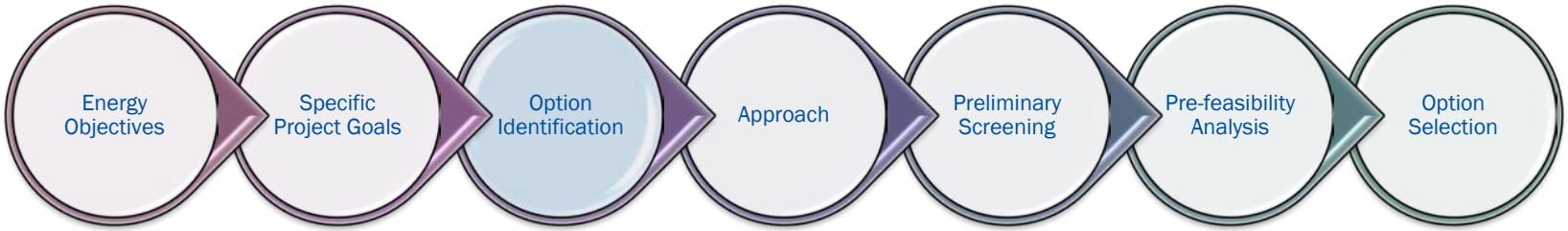
Option Identification (Continued)



The “do-something” options should include *all* feasible technology options (e.g., conventional technologies, renewable technologies, energy efficiency measure(s)) to achieve the defined objectives and specific project goals.

"Do-something" Options. Identify other possible alternative solutions against the "do-nothing" and “do-minimum” options. Such solutions are identified on the basis of how they best meet the objectives or requirements. The "*do-something*" options typically involve an investment depending upon the energy objectives or requirements. In many cases, the focus is placed on cost, where every option is evaluated against the level of investment and amount of savings.

Option Identification (Continued)



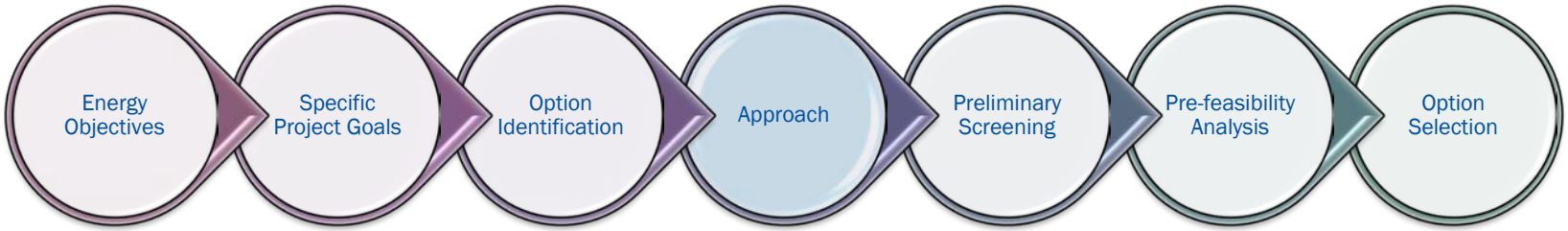
Example:

- **"Current State" Option**: Tribal facilities and residential consumers served by XYZ utility at an electrical load of 7.7MM kWh at an annual cost of $800,000.

- **"Do-minimum" Options**:
  - Implement energy efficiency measures in community buildings and homes at a cost of $1 million, resulting in an energy savings of 10% annually.
  - Fossil-fueled Gensets: Install 2 gensets at $1M with negligible reduction over current utility costs.

- **"Do-something" Options**: Include the list of options evaluated under the analysis, along with a description of the option and key information and benefits.
  - Community Wind Energy Project: 1.5 MW single turbine.
  - Large Scale Wind Energy Project: 25 MW (10-12 turbines) utility scale wind energy project.
  - Community Solar Energy Project: 1 MW community scale solar energy project.

Approach



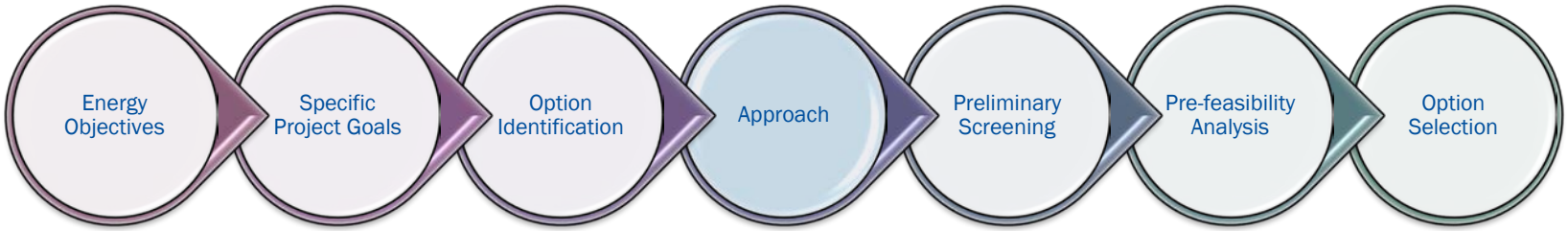
The approach describes the processed used in evaluating the options from the preliminary screening, through the pre-feasibility analysis and how the preferred option was selected.

Example:

The approach used to evaluate options was a three-step process of information gathering and analysis, including

1) Preliminary Screening
2) Vendor Proposals and Inputs; and
3) Design Modeling and Feasibility Analysis

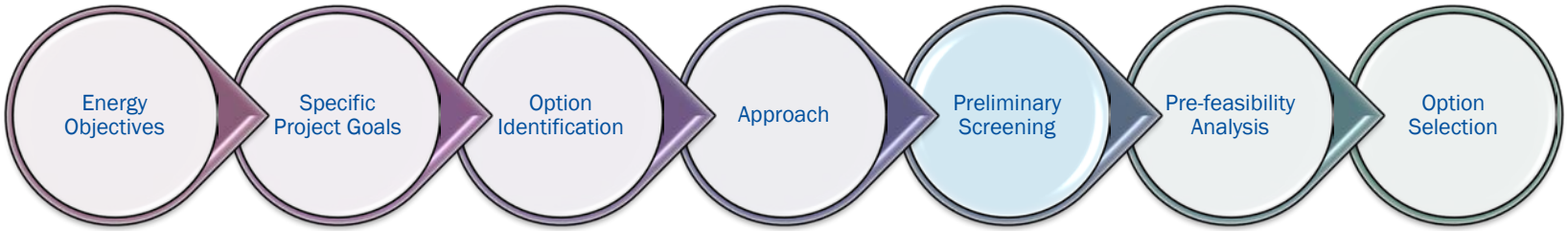
Approach



Expanding on the previous example of the approach:

1) **During Preliminary Screening,** options were considered and ruled out non-viable technologies, designs, and project approaches.
2) **During the Pre-feasibility Analysis,**
   - **Vendor Proposals and Inputs sought**: Identified several qualified vendors and solicited informal project proposals and advice for comparison. [*The use of vendor proposals provides resource and technology information for comparison. The Tribal Energy Atlas may provide some basic information in order to evaluation various energy options*.]
   - **Design Modeling and Feasibility Analysis**: Analyzed feasibility of proposed systems, performed iterative modeling, and produced recommendations. [*The use of models and tools to optimize the selected option and/or to verify information.]*

Preliminary Screening

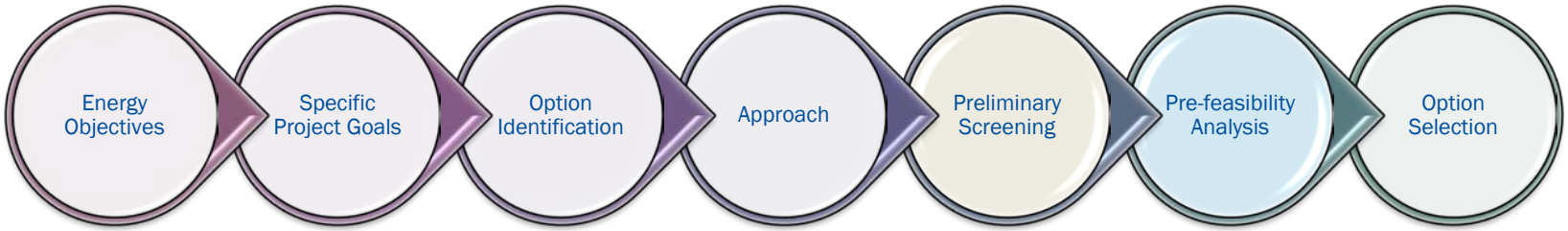


An initial screening of various options before investing in a more detailed analysis. The preliminary screening will evaluate options against specific criteria.

Preliminary screening methods may include:

- Screen the options against the primary and secondary objectives,
- Use a SWOT (strengths, weaknesses, opportunities and threats) analysis,
- Fatal flaws analysis, or
- Identify the pros and cons of each option

Pre-Feasibility Analysis



The pre-feasibility analysis is a more thorough investigation of the options that passed the preliminary screening it might include the following:

- **Carry out demand analysis**. Such an analysis means you must evaluate the need for a project investment through assessing 1) current demand and 2) forecast future demand. Demand analysis aims to formulate a hypothesis about the project's capacity and size which are defined by either current demand or forecast demand. For each of the identified options you need to conduct demand analysis and find out which options ensure the most suitable project capacity and size in terms of current/future demand.

Pre-Feasibility Analysis (Continued)

- **Evaluate energy resources**. Evaluate the availability of energy resources (e.g., conventional and renewable). Technical potential data for conventional fuels are typically proprietary; however, Tribes may be able to access federal assistance to analyze their fossil fuel potential.
  - Contact the Department of Interior's **Division of Energy and Mineral Development** for additional information: https://www.bia.gov/as-ia/ieed/division-energy-and-mineral-development.
  - Renewable energy resource potential information is freely available through the **U.S. Department of Energy Office of Indian Energy-funded Tribal Energy Atlas**: https://maps.nrel.gov/tribal-energy-atlas/. The Atlas also contains information on the location of power lines, gas lines, utility rates, and average household expenditures on energy sources.
  - Technical Assistance available free-of-charge to Indian tribes and tribal entities through the **U.S. Department of Energy Office of Indian Energy**.

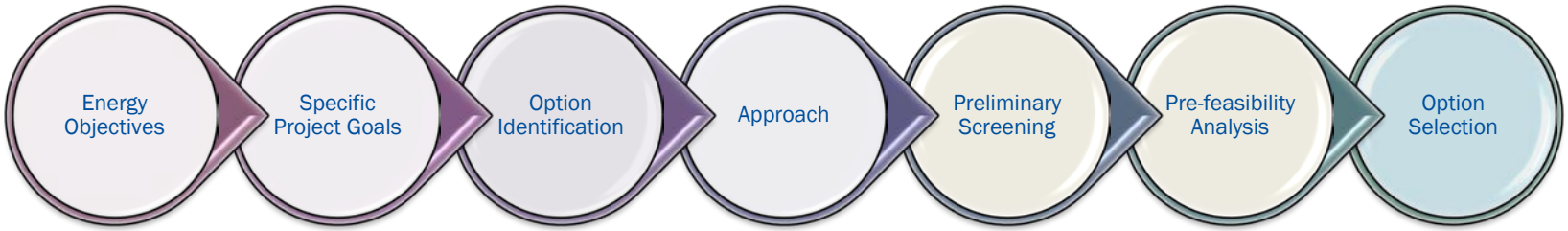
Pre-Feasibility Analysis (Continued)

- **Explore technology alternatives**. Explore all feasible technology alternatives (e.g., conventional technologies, renewable technologies, energy efficiency measure(s)).

- **Other considerations**. Consider other factors such as fuel costs, fuel supply, interconnection, logistics, operation and maintenance, and training.

Putting It All Together

Option Selection



Compare project options and make the final selection.

Example methods to compare project options:

- **Perform multi-criteria analysis**. Another way to select the best project option is to compare all the options by using various criteria. This kind of analysis lets you deal with a suite of different objectives that cannot be aggregated into a single benefit. Specifically, a multi-criteria analysis is when a project is evaluated by more than just monetary terms. It is a form of appraisal that, in addition to monetary impacts, measures variable such as material costs, time savings and project sustainability as well as the social and environmental impacts that may be quantified but not so easily valued.

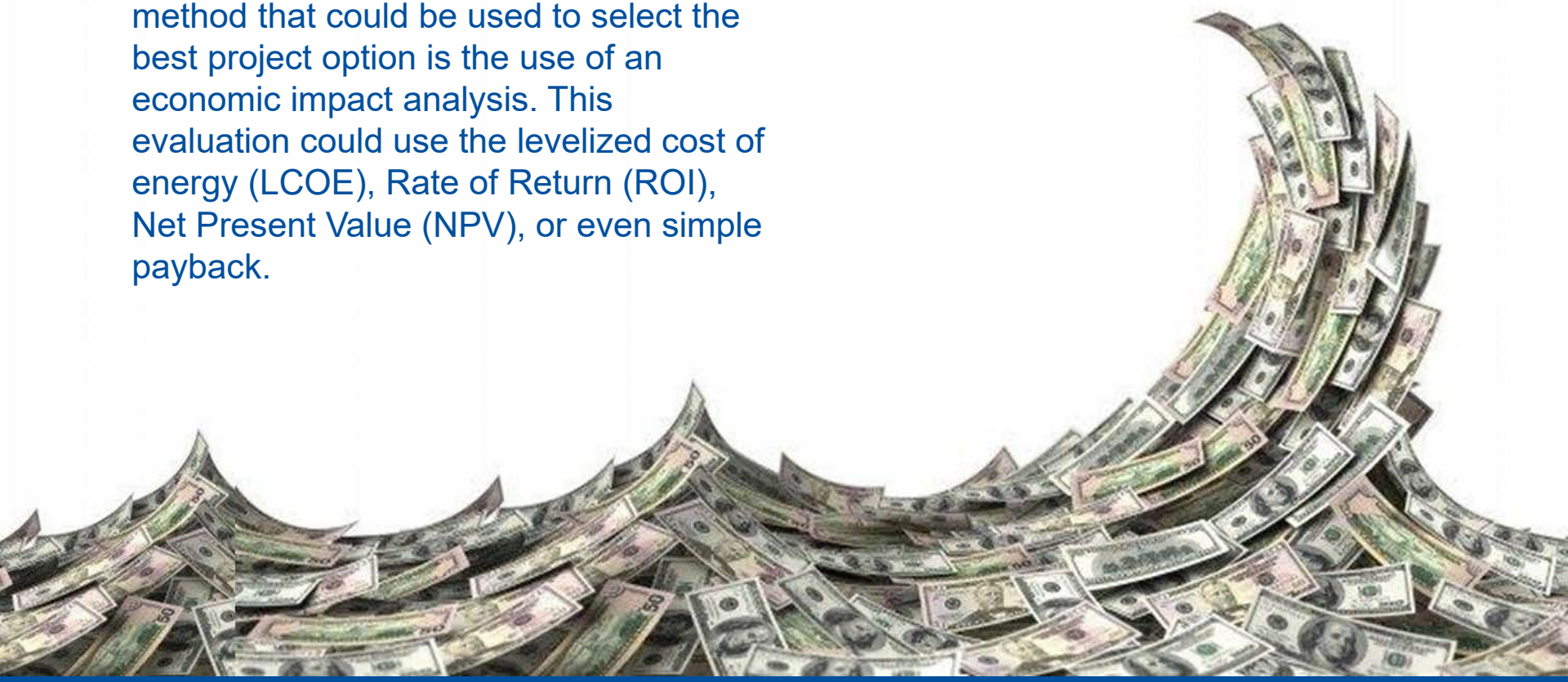
- **Perform cost-effectiveness analysis**. This step is where project options are compared relative to cost and outcomes. Specifically, a cost-effectiveness analysis is a form of economic analysis that compares the relative costs and outcomes (effects) of different courses of action. Cost-effectiveness analysis is distinct from cost–benefit analysis, which assigns a monetary value to the measure of effect. The goal is to select an option that best meets the objectives.

Option Selection

Compare project options and make the final selection.

Example methods to compare project options (continued):

- **Evaluate economic impact**. Another method that could be used to select the best project option is the use of an economic impact analysis. This evaluation could use the levelized cost of energy (LCOE), Rate of Return (ROI), Net Present Value (NPV), or even simple payback.



Tribal Roles and Risk Considerations

Role	Opportunity	Constraints	Comments
Resource/Land Owner	• Land rent/royalty, taxes. • Low risk, known reward, consistent income.	• Limited project control. • Must provide site access.	• Limited upside potential. • Limited risk
Off-taker/ Energy User	• Tribe purchases or uses all power on-site. • May include on-site power generation. • Medium risk, limited investment.	• Limited investment, • Economic development for on-site projects, and capacity-building opportunity	• Must have demand to use power; • Still requires utility interconnection agreement (if on the grid). • Medium risk.
Project Operator/O&M	• Control and self-determination of project; • Potential for profits (and losses) is minimal	• Investors require experience • Consider as a business opportunity (portfolio of projects) • High risk/return investment	• High risk, complex • May be better served by outsourcing • A project pipeline/portfolio mitigates some risks
Lender/ Debt Provider	• Participate financially in project (e.g., cash or New Market Tax Credit (NMTC) with lower risk)	• Requires ready capital • May be cost-prohibitive for single transaction (multiple more cost-effective)	• Med. risk, more complex • Requires lending knowledge • Option for those with limited land, lots of $
Equity Investor/ Gen. Owner	• Provide cash or NMTC for project development. • Less capital than commercial-scale.	• Higher risk than debt lending. • Requires ready capital, or unique source of capital that provides market advantage (like NMTC).	• High risk, more complex • Competes with other investments • Option for those with limited land, lots of $
Project Developer	• Self-determination project. • Potential for profits (and losses) is moderate. • Those with $ don't need investors.	• Investors require experience. • Consider as business opportunity (portfolio of projects). • Tribes investing money may not want this high risk/high return investment.	• High risk, complex • May be better served by outsourcing • A project pipeline/portfolio mitigates some risks

Option Selection

Compare project options and make the final selection

Make the final decision.
At this last step all the steps taken are summarized and it is confirmed whether the analysis has demonstrated that alternative feasible options have been adequately examined and considered and that the best option has been selected.

Questions?

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