Renewable Energy Question 39: *Over what lifecycle are renewable energy projects in Michigan economically evaluated?*

Executive Summary

1. There are multiple time periods over which renewable energy investments are evaluated depending on the purpose and perspective of the economic analysis and other circumstances.
2. There could be long-term value to renewable energy investments from mitigating risks associated with potential climate change legislation or other environmental restrictions in the future. There are also attributes to renewable energy that can decrease its value. These factors can change over time and are not typically considered in traditional economic analyses.

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1. There are multiple time periods over which renewable energy investments are evaluated depending on the purpose and perspective of the economic analysis and other circumstances.

Economic analysis is intended to provide information to make a judgment or decision.[1] There are multiple time periods over which renewable energy investments are evaluated depending on the purpose and perspective of the economic analysis, as summarized in Exhibit 1 below.

EXHIBIT 1. Time Periods Used in Economic Analysis of Renewable Energy Projects

Time Period	Description
Investment Useful Lifetime	Estimate of a particular investment's useful life (can be obtained from manufacturer or industry estimates such as Electric Power Research Institute)
Analysis Period	Period of time for which an evaluation is conducted (e.g., cost-benefit study, return on investment, etc.)
Depreciation Period	Period of time over which an investment is amortized (usually for tax purposes but can also be for utility ratemaking)
Finance Period	Period of time for which an investment's financing is structured (e.g., a loan is amortized over 30 years)
Levelization Period	Period of time used when calculating a levelized cash flow stream or costs of energy

SOURCE: Walter Short, Daniel J. Packey, and Thomas Holt, National Renewable Energy Laboratory, *Manual for Economic Evaluation of Energy Efficiency and Renewable Energy Technologies*, 1995.

According to the National Renewable Energy Laboratory (NREL), the time points selected may all be equal (they generally are), different, or in combinations. The time period selected may also depend on the entity or individual making the calculation (e.g., a utility company versus a homeowner installing rooftop solar). The NREL clarifies that:

> *The selection of an appropriate analysis period is essential. Many times the analysis period is equal to the investment's life span. However, other factors that should be considered include the investor's time horizon and perspective and the decision to be made (accept/reject or choice among alternatives). The investor's time horizon is often used as the analysis period. For example, the independent power producer evaluating a central receiver plant is planning to sell the plant after 10 years and the central receiver plant*

[1] Walter Short, Daniel J. Packey, and Thomas Holt, National Renewable Energy Laboratory (NREL), *Manual for Economic Evaluation of Energy Efficiency and Renewable Energy Technologies*, 1995.

> *under evaluation has an investment life of 30 years. In this example, the analysis period should be 10 years. A longer study period, however, should be used for analyses conducted from society's perspective (30 years or more in most cases).*[2]

For new wind energy projects, the lifespan for evaluation typically ranges between 20 and 30 years depending on the time period used in the analysis (depreciation period, useful life, analysis period). The EIA levelized cost estimates for utility-scale generation of all types (e.g., solar, wind, biomass, and hydro) discussed in detail under Renewable Energy Question 3 are based on a 30-year period. A "meta-study" of various technical analyses on lifecycle emissions of utility-scale wind power showed the most common time period at 20 years, although some were much longer.[3] The Electric Power Research Institute publishes values for generating technology book lives, or the investment life, along with other data in its annual *Renewable Energy Technology Guide* (available for purchase).

2. There could be long-term value to renewable energy investments from mitigating risks associated with potential climate change legislation or other environmental restrictions in the future. There are also attributes to renewable energy that can decrease its value. These factors can change over time and are not typically considered in traditional economic analyses.

There are certain benefits and costs associated with renewable energy that are not always factored into traditional economic analysis of renewable energy projects or comparisons of different resource options.

For example, the current and planned investments in renewable energy and other low-emission technologies such as natural gas generation in the state may prove quite beneficial in terms of diversifying the generation portfolio and improving the emissions profile of the state's electric utilities over the long term. Utilities face uncertainty related to climate change and other current and future environmental laws and regulations. While renewable energy may come at a cost premium in the near term, these are long-term investments that could help mitigate rate impacts in the future in the event of increased environmental requirements at the national or international level.

Notwithstanding these benefits, there are attributes to renewable energy that may decrease its value relative to other sources. As discussed under Renewable Energy Questions 3, 5, 6, and 15, these may include lower capacity value associated with the intermittent power resources, additional transmission costs, integration costs, and the large land footprint necessary for utility-scale wind projects. As with the benefits, these factors can be difficult to quantify and are not typically addressed in economic evaluation of renewable energy projects. Moreover, even when costs or benefits are estimated, they are likely to change over time given the long lifespan of the investments and uncertainty surrounding energy and commodity prices and public policy.

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[2] Short et al., NREL, *Manual*.

[3] Stacey L. Dolan and Garvin A. Heath, Life Cycle Greenhouse Gas Emissions of Utility-Scale Wind Power: Systematic Review and Harmonization, *Journal of Industrial Ecology*, Vol. 16 (S1): April 2012.