Preliminary Report of the Ad Hoc Solar Committee to the State Tax Commission

June 3, 2021

Note: This preliminary report is intended to serve as an exposure draft prior to the issuance of the Committee's final report. New information collected by the U.S. Department of Energy and released June 2021, will be added between the preliminary report and the final report.

Introduction

The State Tax Commission directed the Utility Valuation Section of the Michigan Department of Treasury's Property Tax Division to develop personal property tables for utility transmission and distribution in 1998. These tables were developed by surveying other states, taking input from local governments, the Michigan Public Service Commission, utility companies, and interested individuals. These new tables were adopted in November of 1999.

At that time there were no utility-scale installations (>2 mWh name plate capacity) of solar photo-voltaic cells in Michigan. Modest commercial scale installations of solar photo-voltaic cells (0.5 to 2.0 mWh name plate capacity) commenced in 2011. The first utility-scale project was completed by Indiana Michigan Power in Watervliet in 2016. Projects in the 150 to 200 mWh range are slated for 2021 completion in multiple Michigan communities.

The Ad Hoc Solar Committee was formed at the direction of the State Tax Commission at its August 18, 2020 meeting for the purpose of studying the Commission's recommended valuation procedures for large-scale photovoltaic (solar electric generating) facilities. The panel members were announced at the October 20, 2020 meeting. The Committee consists of the Commission Chair, members of the staff of the Bureau of Local Government and School Services in the Michigan Department of Treasury, representatives from the ad valorem property tax assessment and equalization profession, and a representative from Michigan State University Extension.

Currently, the State Tax Commission's guidance recommends that assessors should apply the SECTION B original cost valuation multiplier table to solar facilities. Developed in 1999, prior to the existence of any large-scale solar facilities in Michigan, this table is designed to value machinery and equipment personal property. Machinery and equipment personal property items exhibit a much wider variation in economic life than is exhibited by solar facility assets.

The Committee was tasked with recommending an ongoing valuation procedure for large-scale solar facilities and, also, of recommending a comparable alternative specific tax, should the legislature decide to exempt the large-scale solar facilities in question from ad valorem assessment. The Committee has sought and obtained information from various public governmental and non-governmental sources, from members of the tax assessment community, and from the industry itself. As a result of this research, the Committee presents the following discussion and demonstration factor tables.

The Use of Original Cost Valuation Multipliers

There are three recognized approaches to appraising an item of tangible personal or real property: The Cost Approach, the Income Approach, and the Sales Comparison Approach.

The Committee does not deem the Income Approach, which requires the identification of an appropriate capitalization rate, and a separately identifiable stream of revenue and expenses, practical for use in the ad valorem assessment of large-scale solar facilities. This impracticality is due to the variations which exist from one project to the next, the atypical specific investment objectives of the investors in solar facilities and the difficulty of separating the income streams of the tangible and intangible elements of the investment. The use of the Income Approach would require the separate valuation of each individual solar facility.

The Sales Comparison Approach, which requires the use of comparable sales adjusted to reflect their similarities and dissimilarities to the subject property, is similarly impractical both because the

Committee has been unable to identify even one arms-length sale of an existing facility and because the scale and complexity of the adjustments needed to use comparable sales are too extensive.

Instead, the Committee's recommendation relies on the principles of the Cost Approach to Value, which seeks to estimate the current reproduction cost, if possible, or current replacement cost, and then deducts depreciation – the loss of value from all sources – from the reproduction or replacement cost. Depreciation includes physical deterioration, functional obsolescence (deficiencies in the subject property when compared to the item which would currently be used to replace it) and external, sometimes referred to as economic, obsolescence (obsolescence caused by causes which are not inherent in the property itself but nevertheless reduce its value). This approach, when adapted to the mass appraisal techniques necessarily relied on by assessors, is reflected in the use of original cost valuation multipliers.

Original Cost Valuation Multipliers

The most often employed method of valuing personal property in Michigan for purposes of mass appraisal (property tax assessment administration) is using original cost valuation multipliers applied to the historic cost of acquiring the property, as determined using generally accepted accounting principles. For each vintage year of acquisition there is a corresponding multiplier which translates historic cost into an estimate of current true cash value. There are a different series of multipliers used for different types of property. These multipliers are not depreciation tables – in fact, it is even conceivable that for some types of property the multipliers will not decline - although that is generally not the case. The multipliers differ from depreciation tables in several respects:

- Financial accounting depreciation estimates the economic benefit derived from the item, both in terms of length and timing, at the outset, when the vintage year grouping is initially placed in service, while mass appraisal original cost multipliers value only the survivors of the vintage year group as of each successive valuation date. The multipliers must continue to value every survivor until it is retired from service and must also reflect the removal of shorter life, retired assets.

- Financial accounting depreciation allocates the original historical cost over the accounting periods which are benefited, without determining, or even caring, whether the book value, after depreciation, represents the current true cash value of the property. Original cost valuation multipliers, on the other hand, seek to estimate the true cash value of the property as of each valuation date and must reflect changes in the cost of obtaining a replacement item, whether that cost is higher or lower.
- If there is variability in the economic life of the assets in the asset grouping, then the inclusion of the shorter life assets might initially result in a lower early vintage age multiplier. On the other hand, the early retirement of the shorter life assets results in a higher multiplier in later vintage years for the survivors.

The Basic Assumptions Made by the Committee

The Committee's Recommendation is predicated on the following:

- The solar facility includes all components which are needed to make the facility operational. All costs incurred, including indirect and intangible costs such as design costs and patent rights, which would be included for booking the asset under generally accepted accounting principles would be reported.
- The facility includes all components which are positioned up to, and including, the inversion of the current. Battery storage systems are deemed to be components of the solar facility if located on-site with the solar facility. Components located after conversion of the electricity to alternating current are reported as Electric Transmission personal property using form Treasury 3589 – *Cable Television and Utility Personal Property Report*.
- All costs are reported based on the booking of project costs using generally accepted accounting principles (GAAP) and such costs must include all amounts for which an investment tax credit was allowed or allowable, even though those costs were offset by the credit.
- If components are replaced during the project life cycle, the cost of the original component is removed from the reported cost and the cost of the replacement component is reported in the year that it is placed in service.

- The Committee's recommendation is only applicable to large scale solar facilities developed for the commercial sale of the electricity produced and only to projects have a rated output larger than 2.0-megawatt hour - name plate capacity (mWh NPC).
- Similarly, although the Committee could develop valuation procedures for residential and commercial photovoltaic systems which provide onsite power to one user, it has not done so and the multipliers which the committee proposes are not suitable for those systems. In some, or perhaps many, cases these smaller systems will be valued as real property and their value based on the contribution they make to the value of the real property. Parenthetically, for the most part, residential systems are exempt until there is a sale of the property, arising from the fact that they benefit from Mathieu-Gast non-consideration of value pursuant to MCL 211.27(p).
- A difficulty encountered by the Committee was the dramatic decline in costs which have occurred over the past ten years (the time period which is relevant in Michigan, given the installation dates of the existing projects.) This analysis results in much lower multipliers for already installed systems than will be appropriate for newly installed systems in later years. Therefore, as previously stated, the Committee has determined, and recommends to the Commission that the valuation multipliers must be developed for each future assessment year.

Assumptions and Determinations Based on the History and Characteristics of Photovoltaic Generation Development

The Committee's Recommendation is predicated on the following:

- Much of the data presented to, or discovered by, the Committee are presented in inflation-adjusted dollars (2019 US$). In both already developed systems and in systems installed in the future, the taxpayer will be reporting their actual costs. It has been necessary for the Committee to "un-adjust" the data to obtain an indication of dollars spent or which will be spent to install systems in the future. For purposes of measuring actual dollars spent, the Committee has used the cost-of-living data from U.S. Bureau of Labor Statistics. This methodology duplicates the adjustments used the U.S. Department of Energy when reporting the cost of power purchase agreements as inflation adjusted dollars (2019 US$).[1] For 2021, the Committee has used an estimated inflation rate of 2.5% from the midpoint of multiple mid-year projections for core costs from the U.S. Bureau of Labor Statistics. For future years, the Committee has assumed an inflation rate of 2.25% because the Department of Energy is using a 2.25% inflation rate in their solar expense and longevity estimates.

- Since the first systems were completed in the 1970s, the cost of certain components of the systems have declined dramatically and their output and economic life has increased due to technological improvement and improved manufacturing techniques. Further, some costs, particularly some installation costs, have also declined, as measured in constant dollars. For example, the solar modules have not only improved in design, manufacturing, and ease of installation but the inflation adjusted cost has literally declined by 99%, as measured by output since the 1970s. Between 2010 and 2020, the cost of modules has declined by approximately 90%. Between 2016 and 2020, the cost has only declined by approximately two-thirds. Recently, however, the decline has moderated substantially, and most recently there is evidence that costs have increased. Further, since most of modules used today are manufactured in China, the potential for cost increases caused by tariffs exists. A constant cost of $25 per mWh PPA in (2019 US$) has been used for future years in the factor table[2].
- Although the cost of the modules and, to some extent, the inverters, has declined dramatically, these components represent only a portion of the project cost. While the project costs have declined, driven largely, but not exclusively, by the reduction in the cost of the module and inverter components, the decline in total project cost has declined much less dramatically.
- The Committee's investigation indicates that depending on the size of the project, the cost of the modules and of the inverters, as a percentage of the total project cost, varies between 33.06% for 5-mWh PPA (power purchase agreement) and 43.62% for 100-mWh PPA, in the case of the

[1] Bolinger, Mark, Joachim Seel, Dana Robson & Cody Warner. *Utility-Scale Solar Data Update: 2020 Edition.* Lawrence Berkeley National Laboratory, October 2020, pp. 32 (Column B50 thru B60).

[2] Cox, Molly. "Key 2020 US Solar PV Cost Trends and a Look Ahead." *Greentech Media.* 17 December 2020. https://www.greentechmedia.com/articles/read/key-2020-us-solar-pv-cost-trends-and-a-look-ahead (Accessed 2 March 2021) and Murtaugh, Dan and Brian Eckhouse. "Solar Power's Decade of Falling Costs Thrown Into Reverse," *Bloomberg Green*, 24 May 2021. https://www.bloomberg.com/news/articles/2021-05-23/solar-power-s-decade-of-falling-costs-is-thrown-into-reverse (Accessed 28 May 2021).

modules, and between 4.03% for 5-mWh PPA and 5.32% for 100-mWh PPA, in the case of the inverters.[3] Given the planned output of the 2020 and 2021 Michigan facilities which are coming online in the 150- to 200-mWh NPC range, the Committee has used a percentage of 43.62% for the installed modules and 5.32% for the installed inverters from the cost variance reported for 100-mWH PPA facilities. The balance of the project cost comes in the form of other electrical equipment costs, other structure costs (racks, etc.), labor, design, permits, transmission connection, land acquisition (but not the land itself), developer incurred taxes, interconnection fees, and developer, overhead, margin and contingencies. Although these latter costs have experienced categorical declines due largely to installation efficiencies, the Committee believes that these costs largely track inflation in the future.

- Although the Committee has discussed whether it is appropriate to provide separate multipliers or additional valuation procedures for facilities which track the sun and for facilities that feature storage of the electricity, it does not recommend any special treatment at the present time. The Committee has identified only one facility that tracks and although such systems produce more electricity, they also have a higher installed cost, and do not always operate as intended. Currently, the Committee believes that the increased cost/increased production of facilities offset each other and that the same valuation multipliers should be used.
- As far as the Committee can determine, there is only one Michigan facility which features battery storage, Circuit West in the City of Grand Rapids with a 500-mWh battery. This facility is smaller than the 2-mWh and above range covered by the updated factors. Such storage is included in projects based primarily on their relationship to the grid at-large or to a specific user of the electricity generated and no separate multipliers have been developed for battery components. If the Committee is asked to develop multipliers for smaller systems or if new projects feature battery storage, then it may be appropriate in those circumstances to address the valuation of battery storage.
- Although the rate of technological change in the photovoltaic industry has reduced dramatically, one of the significant uncertainties experienced by the Committee in completing its assignment is

[3] Feldman, David, et al., *U.S. Solar Photovoltaic System Cost Benchmark: Q1 2020.* National Renewable Energy Laboratory, January 2021, pp. 53.

the possibility that future technological change will affect the future projections necessarily made by the Committee. The Committee has projected no further reduction in the project costs. To err on the side of conservatism, the Committee has assumed that the economic life of the entire project is measured by the life of the most durable component, the racking system. Due to the potentially shorter economic life of PV modules and inverters, there may come a time when the modules and inverters will be traded out, perhaps in their entirety, while the balance of the facility including other equipment and project development costs, representing the greater part of the project cost continues in service.

- The Committee's investigation has led it to conclude that the racking and support systems have an anticipated economic life of 25 years, on average, for systems installed before 2018 and 30 years, on average, for future planned systems. This economic life determination should be revisited periodically, and the appropriate economic life calculations updated for future tables.
- The Committee investigation indicates that the inverters have an economic life of 14 years, on average. This economic life determination should be revisited periodically, and the appropriate economic life calculations updated for future tables.
- The Committee has determined that the modules currently have not only a relatively long economic life but that they are warranted by their manufacturer for a long functional life, typically 25 to 30 years or more, depending on the date of installation. A module is in a state of failure when its efficiency has dropped below 80% of its original performance. The Committee investigation indicates that the modules are warrantied for and have an anticipated economic life of 25 years for systems installed before 2018 and at least 30 years for future planned systems. This economic life determination should be revisited periodically, and the appropriate economic life calculations updated for future tables.
- The Committee has determined that the efficiency of the modules declines as they age, and it has adopted the Actual Indexed Capacity Factor Weighted Average as published by Berkeley Labs. These factors are released annually and are normalized to a multiplier of 1.00 for the most

current year. A future functional adjustment of 1.1% as projected by Berkeley Labs[4] has been used to create future factor estimates.

- The system residual multiplier has been determined in anticipation that the useful economic life of some systems or system components may extend past the anticipated 30-year period. These facilities may have components that have greater than expected economic life for the facility and may be re-powered and/or re-racked instead of decommissioned. Additionally, even if the facility is decommissioned, the committee anticipates that certain components will have salvage value. The Committee has adopted a minimum factor of 0.12 in anticipation of these factors.
- Although the first Michigan utility-scale solar installation was constructed in 2016, the Committee recognizes that earlier commercial-sized systems may be expanded or re-powered and/or re-racked to exceed the minimum 2 mWh-NPC size necessary to be included on the utility-scale table. In anticipation of this potential increase in capacity, factors have been developed back to the earliest known commercial-scale installation date. Taxpayers would be instructed to report the surviving costs of the older system components on the year they were acquired and report expansions, new modules, inverters, and re-racking costs in the year they were placed in service.

The Handling of Tax Incentives Available to the Developers of Solar Facilities

The Committee has made no adjustment in the proposed original cost valuation multipliers to reflect tax incentives which benefited most of the existing projects and which would not be available to a hypothetical purchaser of any of those projects. For the most part, the existing projects qualified for a 30% Federal Investment Tax Credit (hereafter “ITC”) plus five-year optional, accelerated ACRS [income tax depreciation] for the balance of the project cost.

The ITC was extended for another two years in the 2021 Omnibus Spending bill passed December 2020. For projects where the equipment was purchased prior to December 31, 2019 the 30% credit remains. The ITC is then reduced to 26% for systems commencing construction in 2020 thru 2022 and

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[4] Bolinger, Mark, Joachim Seel, Dana Robson & Cody Warner. *Utility-Scale Solar Data Update: 2020 Edition*. Lawrence Berkeley National Laboratory, October 2020, pp. 26 (Column E28 thru E39).

to 22% for systems commencing construction in 2023 and 2024. Current legislation reduces the ITC to 10% in systems commending after 2025. Notably, however, if the project is sold within six years of the date that it was placed in service, there is a recapture provision which reverses the benefit of the ITC. The Committee is aware of Tax Tribunal and other judicial opinions that determined that the ITC should be considered in valuing wind energy systems but does not believe that these decisions are relevant, given the change in the economics of the solar industry, the phased reduction of the benefit and the existence of the recapture provisions.

The Committee has based its determination not to adjust its proposed multipliers on the following reasoning:

- The Committee believes that decisions based on appraisals which use an income shortfall methodology to determine economic obsolescence in the cost approach are not reliable. The Committee has concluded that the use of an income shortfall methodology suffers from the same limitations as the income approach itself. Specifically, the investment objectives of potential investors, and the identification of capitalization rates, and separation and projection of future revenue and expenses is unreliable.
- The Committee further notes that under appraisal theory, economic obsolescence is only applied after the application of physical deterioration and functional obsolescence. Therefore, even if relevant, the actual effect of any asserted economic obsolescence is significantly diminished by the fact that it would only be applied after the application of physical and functional loss of value. This diminishment is enhanced by the fact that for the first six years the project is in service, the original investor stands in no better position than does a prospective purchaser, arising from the recapture provision.
- The Committee believes that the ITC extension was part of a fiscal stimulus package to alleviate the economic impacts of the coronavirus pandemic and was not intended to provide the means of making an economically unsupportable investment feasible. Since the project costs have declined dramatically, there is little or no independent economic justification for the ITC, except as a stimulus. The Committee believes that this fact is reflected by the phased reduction of the ITC and the recapture provision.

- The Committee further believes that the value should be based solely on the project's economic viability. The Committee does not believe that the values determined using the proposed multipliers fail to justify (support) the investment. It notes that appraisal theory is predicated on the Principle of Substitution, and that a potential investor could not today timely develop a project which would benefit from the 30% ITC and, soon may not be able to develop a project which benefits from any ITC greater than 10%. Further, even this 10% credit would be subject to recapture. Therefore, a prospective purchaser would not compare the purchase of an existing project unfavorably with the alternative of constructing a new project, particularly since a new project would require significant time to plan, design, and build.
- The Committee is mindful of the fact that the task is to value the asset, not the investment. Several judicial decisions have recognized that true cash value is not always the same as the investment value. In fact, the investment value is a difficult concept, particularly in cases where there are tax incentives which may only be useful to investors who are in certain individual circumstances. The Committee believes that the value of a solar facility's property is not measured solely by its investment value and that the utility of the property, as measured against the value calculated through the use of the proposed valuation multipliers, is sufficient to support the investment.
- Finally, but importantly, any assertion that the lack of availability of the ITC to an investor purchasing an existing system will negatively affect the price paid, assumes that in the future the net revenue will not be sustained at, or increased to, a sufficient level if the ITC is not available to a subsequent purchaser. The Committee questions whether this is true. The United States economy becomes more invested in solar every year, not because the price of the electricity is less (in fact, it is more) but because of both government environmental mandates and the commitments of citizens and business to clean energy. The Committee believes that the demand for solar generated electricity will not decline, but will increase, relative to other sources, even if the price of its electricity increases. If this occurs then existing systems may experience increased profits – profits which cannot be obtained by newly built systems - and the investment value of the existing systems may increase, not decline.

Demonstration Solar Factor Tables

A preliminary table is presented for the upcoming assessment year. The Committee has also exhibited a demonstration table for an assessment year five years in the future and a demonstration table for an assessment year ten years into the future. These latter tables are to demonstrate potential differences in the new investments with flattening projected cost reductions and longer project lives.

Preliminary Solar Factor for 2022 assessments (2019/2020 data)*					
Year	**Average PPA Price**	**Cost Factor**	**Weighted Physical % Good**	**Indexed Capacity Factor Weighted Average**	**Cumulative Factor (min 0.12)**
2009 & prior					0.12
2010	$109.94	0.237	52.59%	0.895	0.12
2011	$90.97	0.287	56.76%	0.887	0.14
2012	$72.72	0.359	60.92%	0.901	0.19
2013	$60.39	0.432	65.09%	0.921	0.25
2014	$50.06	0.521	69.26%	0.916	0.33
2015	$43.97	0.593	73.42%	0.931	0.40
2016	$36.74	0.710	77.59%	0.971	0.53
2017	$37.39	0.698	81.76%	0.978	0.55
2018	$28.58	0.913	85.93%	0.985	0.77
2019	$24.16	1.080	90.44%	0.978	0.95
2020	$25.45	1.025	94.64%	0.989	0.95
2021	$26.09	1.000	98.58%	1.000	0.98

*Information will be updated in June 2021 after Berkeley Labs releases 2020 data.

Demonstration Solar Factor for 2027 assessments					
Year	**Average PPA Price**	**Cost Factor**	**Weighted Physical % Good**	**Indexed Capacity Factor Weighted Average**	**Cumulative Factor (min 0.12)**
2010 & prior					0.12
2011	$90.97	0.321	36.49%	0.832	0.12
2012	$72.72	0.401	40.28%	0.840	0.13
2013	$60.39	0.483	44.25%	0.832	0.18
2014	$50.06	0.583	48.42%	0.846	0.24
2015	$43.97	0.663	52.59%	0.866	0.30
2016	$36.74	0.794	56.76%	0.861	0.41
2017	$37.39	0.780	60.92%	0.876	0.43
2018	$28.58	1.020	65.09%	0.916	0.61
2019	$24.16	1.207	70.33%	0.923	0.78
2020	$25.45	1.146	75.21%	0.934	0.80
2021	$26.09	1.118	79.77%	0.945	0.84
2022	$26.68	1.093	84.04%	0.956	0.87
2023	$27.28	1.069	88.05%	0.967	0.91
2024	$27.89	1.046	91.59%	0.978	0.93
2025	$28.52	1.023	95.12%	0.989	0.96
2026	$29.16	1.000	98.66%	1.000	0.98

Demonstration Solar Factor for 2032 assessments					
Year	**Average PPA Price**	**Cost Factor**	**Weighted Physical % Good**	**Indexed Capacity Factor Weighted Average**	**Cumulative Factor**
2012 & prior					0.12
2013	$60.39	0.540	25.13%	0.811	0.12
2014	$50.06	0.651	28.91%	0.806	0.15
2015	$43.97	0.741	32.70%	0.821	0.19
2016	$36.74	0.887	36.49%	0.861	0.27
2017	$37.39	0.872	40.28%	0.868	0.30
2018	$28.58	1.140	44.25%	0.875	0.44
2019	$24.16	1.349	50.22%	0.868	0.58
2020	$25.45	1.280	55.78%	0.879	0.62
2021	$26.09	1.249	60.96%	0.890	0.67
2022	$26.68	1.222	65.81%	0.901	0.72
2023	$27.28	1.195	70.37%	0.912	0.76
2024	$27.89	1.169	73.91%	0.923	0.79
2025	$28.52	1.143	77.44%	0.934	0.82
2026	$29.16	1.118	80.98%	0.945	0.85
2027	$29.81	1.093	84.51%	0.956	0.88
2028	$30.49	1.069	88.05%	0.967	0.91
2029	$31.17	1.046	91.59%	0.978	0.93
2030	$31.87	1.023	95.12%	0.989	0.96
2031	$32.59	1.000	98.66%	1.000	0.98

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