RESOURCE GUIDE:
TAXING UTILITY-SCALE SOLAR PROJECTS IN IOWA

Iowa is in the middle of an unprecedented boom in solar energy at all levels. Utility-scale solar, the largest type of project, is defined as a solar energy system with enough capacity to produce electricity to sell to energy providers, not to directly supply end-use customers. As of 2018, the average project capacity for utility-scale solar was 5 megawatts (MW), but recently these projects are being expanded to produce hundreds of megawatts of electricity.[1]

The first utility-scale projects came before the Iowa Utilities Board for approval in summer 2019 with a 100 MW project proposed in Louisa County, followed by a series of projects totaling 749 MW in Worth, Mitchell, and Howard counties. The rapid expansion of investment in solar energy has spurred many local officials to see it as an economic development tool that also produces affordable and renewable electricity. As counties begin to explore utility-scale solar within their boundaries, deciphering the level of tax revenue generated by each project can help ensure the greatest return on investment for their constituents.

IOWA'S REPLACEMENT TAX (§437A)

Iowa's Replacement Tax is designed to nullify property taxes that would be imposed on electric companies, natural gas companies, electric cooperatives, and municipal utilities and replace those with a system of taxation that imposes similar generation, transmission, and delivery taxes on competitors who generate, transmit, or deliver electricity or natural gas in the same competitive service area. The tax is also intended to preserve revenue neutrality and debt capacity for local governments and taxpayers, preserve neutrality in the allocation and cost impact of any Replacement Tax among and upon consumers of electricity and natural gas in this state, and to provide a system of taxation that reduces existing administrative burdens on state government (§437A.2).[2]

The total tax revenue generated by a utility-scale solar project consists of calculating three separate assessments:

1. Replacement Tax imposed on electric generation,
2. Replacement Tax imposed on delivery of electricity, and
3. Replacement Tax imposed on electric transmission.

Once collected by county treasurers, the Replacement Tax liability is distributed to local taxing bodies (schools, cities, counties, etc.) in the same manner as property taxes. Separately, utility-scale solar projects are also subject to a statewide property tax assessment, the revenue from which is directed into the state's general fund.

EQUATIONS AND EXAMPLES

For the purpose of creating tangible examples with the tax equations set forth in this publication, we have chosen to use a 200 MW utility-scale solar project in central Iowa within one of the two investor-owned utility service areas as a hypothetical situation. This example also hypothesizes that the owner of this utility-scale solar project owns 5 pole line miles of a 35 kilovolt (kV) high-voltage transmission line. The project is assessed at a total value of $200 million. An assumption is made that the project emits the same amount of electricity for each day in a year; given the common curtailment of utility-scale solar projects, this assumption is likely not frequently replicated. This project does not exist and only serves to facilitate the calculation of hypothetical examples.

PART ONE: REPLACEMENT TAX IMPOSED ON ELECTRIC GENERATION (§437A.6)

The Replacement Tax is used to calculate the applicable taxes for utility-scale solar projects in Iowa. The Replacement Tax rate imposed on electric generation in Iowa is equal to six-hundredths of a cent for each kilowatt-hour (kWh) of electricity generated within the state during the relevant tax year. This means for each kilowatt-hour of electricity produced by a utility-scale solar project, the project owner must pay $0.0006. This component of the Replacement Tax will be returned to the county after collection at the state level.

Note: The following equations reflect a fictional scenario that most likely represents the baseline of several solar installations in the state for production. To view the most accurate information possible about a proposed solar energy project, use the PVWatts Calculator from the U.S. Department of Energy.[3]

Equation:	**Project capacity (kW) X Average annual radiation in Des Moines, Iowa = Maximum total kWh/day**
Example:	200 MW = 200,000 kW X 4.8[4] = 960,000 kW/h
Equation:	**Maximum total kWh/day X Average solar capacity factor[5] = Actual total kWh/day**
Example:	960,000 kW/h X 23.54% = 225,984 kWh/day
Equation:	**Actual Total kWh/day X 365 days = Actual total kWh/year**
Example:	225,984 kWh/day X 365 days = 82,484,160 kWh/year
Equation:	**Actual total kWh/year X Replacement Tax rate imposed on electric generation = Total revenue generated by the Replacement Tax imposed on electric generation in a tax year**
Example:	82,484,160 kWh/year X $.0006/kWh = $49,490.50 total revenue generated by the Replacement Tax imposed on electric generation in a tax year

PART TWO: REPLACEMENT TAX IMPOSED ON DELIVERY OF ELECTRICITY (§437A.4)

For an owner of a utility-scale solar project that delivers electricity for sale to an end-user or a utility, a Replacement Tax is imposed on that delivery only if the owner is selling directly to end-users in a specific utility service area. The delivery tax rates imposed in this section are dependent upon which utility service area the energy is delivered in. If the energy from the project is sold to another utility, as is often the case with utility-scale solar, a Replacement Tax on delivery need not be paid by the solar project owner. These tax rates are revised twice yearly by the Iowa Department of Revenue and are published in May and December. The most recent publication of these electric delivery tax rates in the Iowa Administrative Bulletin included 26 different rates based on utility service areas.[6] For project owners generating and delivering electricity in multiple utility service areas, several delivery tax rates may be applicable and are multiplied by the total kWh delivered in the relevant utility service area in a tax year. Utility service areas can be found by consulting the Iowa Utilities Board Electrical Service Area Boundaries map.[7] This component of the Replacement Tax will be returned to the county after collection at the state level.

Equation: **Total kWh delivered in the utility service area in one tax year X delivery tax rate for the utility service area where electricity was delivered = total revenue generated by the Replacement Tax imposed on delivery of electricity in a tax year**

Example: $0.00259183 (Relevant delivery tax rate as of May 2020 for the relevant utility service area) X 82,484,160 (Actual total kWh/year delivered in this service area) = $213,784.92 (Total revenue generated by the Replacement Tax imposed on delivery of electricity in a tax year)

PART THREE: REPLACEMENT TAX IMPOSED ON ELECTRIC TRANSMISSION (§437A.7)

Utility-scale solar project owners who also own transmission line property must pay the Replacement Tax imposed on electric transmission. If the project owner sends its energy to the electric grid through a transmission line that is owned by a third party, the project owner is not responsible for the payment of this tax. The rate for this tax is calculated based on the number of pole line miles owned or leased in a tax year, as well as the capacity of that transmission line, in kilovolts, in a tax year. The Iowa Department of Revenue charges the following rates for the Replacement Tax imposed on electric transmission:[8]

4.5 to 100 kV	x	$ 550 per pole line mile	=	$
101 to 150 kV	x	$ 3,000 per pole line mile	=	$
151 to 300 kV	x	$ 700 per pole line mile	=	$
More than 300 kV	x	$ 7,000 per pole line mile	=	$

This component of the Replacement Tax will be returned to the county after collection at the state level.

Equation: **Rate for transmission lines within given capacity range per pole line mile X number of owned or leased pole line miles = total revenue generated by the Replacement Tax imposed on electric transmission in a tax year**

Example: 5 miles X $550 per pole line mile = $2,750 total revenue generated by the Replacement Tax imposed on electric transmission in one tax year

PART FOUR: STATEWIDE PROPERTY TAX (§437A.18)

The statewide property tax is assessed at 3 cents for every $1,000 of value on property used for the generation, delivery, and transmission of electricity within Iowa. To calculate this tax assessment, the state requires a final total cost of the project and a calculation of projected depreciation. This total acquisition cost, minus projected depreciation (up to a maximum of 70 percent), is what the state requires in Replacement Tax Form C from utility-scale solar project owners. According to the National Renewable Energy Laboratory at the U.S. Department of Energy, the average cost of building a utility-scale solar project remains at approximately $1 million for each megawatt of solar capacity.[9]

Equation:	**Total acquisition cost — accumulated depreciation = book value used by the state to calculate statewide property tax assessment**
Example:	$200,000,000 (total project cost for 200 MW project) — $100,000,000 (50 percent accumulated depreciation) = $100,000,000 (book value used by the state to calculate statewide property tax assessment)
Equation:	**Book value used by the state to calculate statewide property tax assessment / 1,000 = book value per $1,000 of value**
Example:	$100,000,000 book value / 1,000 = 100,000
Equation:	**Book value per $1,000 of value X statewide property tax rate = total revenue to the state's General Fund from the statewide property tax assessment on property used for generation, delivery, and transmission in Iowa in one tax year**
Example:	100,000 X $0.03 = $3,000 in total revenue to the state's General Fund from the statewide property tax assessment on property used for generation, delivery, and transmission in Iowa in one tax year

EXAMPLE: TOTAL TAX REVENUE GENERATION

$49,490.50

Total revenue generated by the Replacement Tax imposed on electric generation in a tax year

+

$213,784.92

Total revenue generated by the Replacement Tax imposed on delivery of electricity in a tax year

+

$2,750.00

Total revenue generated by the Replacement Tax imposed on electric transmission in one tax year

+

$3,000.00

Total revenue to the state's General Fund from the statewide property tax assessment on property used for generation, delivery, and transmission in Iowa in one tax year

=

$269,025.42 total tax revenue generated

*by a hypothetical 200 MW utility-scale solar project in central Iowa within one of the two investor-owned utility service areas with an assumed ownership of 5 pole line miles of a 35 kV transmission line

SECTION TWO: DEFINITION OF TERMS

Project capacity:	This refers to the total capacity of the installed utility-scale project. Commonly, this is expressed in megawatts and can reach several hundred for large solar installations. To calculate the Replacement Tax components, this must be converted to kilowatts, one of which is the equivalent of 0.001 megawatt.
Average annual radiation:	The number of daily hours in a month or year equivalent to the full sun intensity is referred to as the solar radiation. The Department of Energy's National Renewable Energy Laboratory has compiled the solar radiation for sites across the U.S. on both a monthly and annual basis for different tilt angles. For this example, we have used the annual radiation in Des Moines, at a tilt angle equal to its latitude (about 42°), which is 4.8 hours.[10]
Maximum total kWh/day:	This number is calculated by multiplying the maximum possible output of a project (i.e. total capacity in kW) by the average annual radiation in a given area. In this example, a 200 megawatt project in Des Moines could theoretically produce up to 480,000 kWh each day. However, most systems do not meet their total possible output on any given day or each day of a given year.
Average solar capacity factor:	Solar capacity factor is a measure of how much energy is produced by a plant compared with its maximum output potential. This is measured as a percentage, generally by dividing the total energy produced during some period of time by the amount of energy the plant would have produced if it ran at full output during that time. In this example, the average capacity factor for photovoltaic utility-scale solar averages 23.54 percent between 2010 and 2019.[11]
Actual total kWh/day:	This figure is calculated by multiplying the maximum total kWh/day by the average solar capacity factor. This number is a reflection of the actual total kWh/day based on the average solar capacity factor because it quantifies how often a solar energy project meets its maximum possible output. In this example, the 200 MW solar project could, in theory, produce 480,000 kWh each day. However, given that the project only reaches full capacity 23.54 percent of the time, the actual total output of kWh/day is 225,984 kWh/day.
Actual total kWh/year:	This figure is a quantification of the total actual production of kWh in one year of this project. This can be calculated by multiplying the actual total kWh/day by the number of days the project operates in a given year. In this example, we have assumed the project operates all 365 days. However, solar is a distributed resource that is often curtailed, especially at the utility scale. A more accurate number of days the project will operate could affect the total tax revenue generated over one year.

Replacement Tax:

This tax is assessed on electric companies, natural gas companies, electric cooperatives, and municipal utilities that generate, produce, transmit, or deliver electricity and natural gas in Iowa. However, the following are exempt:

- A low capacity factor electric power generating plant;
- Facilities owned by or leased to a municipal utility when devoted to public use and not held for pecuniary profit, except facilities of a municipally owned electric utility held under joint ownership or lease and facilities of an electric power facility financed under chapter 28F or 476A;
- Wind energy conversion property subject to section 427B.26 or eligible for a tax credit under chapter 476B;
- Methane gas conversion property subject to section 427.1, subsection 29, to the extent the property is used in connection with, or in conjunction with, a publicly owned sanitary landfill or used to collect waste that would otherwise be collected by, or deposited with, a publicly owned sanitary landfill;
- Facilities owned by or leased to a state university or university of science and technology, to the extent electricity generated by such facilities is consumed exclusively by such state university or university of science and technology; and
- On-site facilities wholly owned by or leased in their entirety to a self-generator (§437A.6).

SOURCES

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