

Hot-Dip Galvanized

# Solar Projects



**Durable**

**Attractive**

**Sustainable**

**Cost-Effective**

**Maintenance-Free**

American Galvanizers Association

# Hot-Dip Galvanized Steel for Solar Projects

Solar energy provides clean, sustainable power and is becoming an increasingly popular form of alternative energy. Many states are looking to reduce use of fossil fuels and save taxpayers money. As more large-scale renewable energy projects are becoming common place in multiple states across the country, the need for sustainable, durable, maintenance-free solar structures that work in synergy with the green nature of solar power are desirable. In order to protect these new investments and have solar panels continue to be a reliable power source, proper corrosion protection methods should be in place. Hot-dip galvanizing (HDG) provides corrosion protection that will not only recoup initial costs over the lifetime of the project with maintenance-free protection, but will also stand the test of time against harsh environmental conditions; providing steel with superior durability, sustainability, and maintenance-free protection.

## SUSTAINABLE

Solar energy is a renewable and plentiful energy option, and architects and engineers responsible for the structures try to embody green techniques, using sustainable construction materials to further benefit the environment. Sustainable development is the social, economic, and environmental commitment to growth and development that meets the needs of the present without compromising the ability of future generations to meet their needs. The steel and zinc used in the hot-dip galvanizing process are both 100% recyclable at the end-of-life without the loss of any physical or chemical properties. In addition to being recyclable, HDG can last 75 years without maintenance, ensuring no additional raw materials are used or emissions created once the structure is in use.

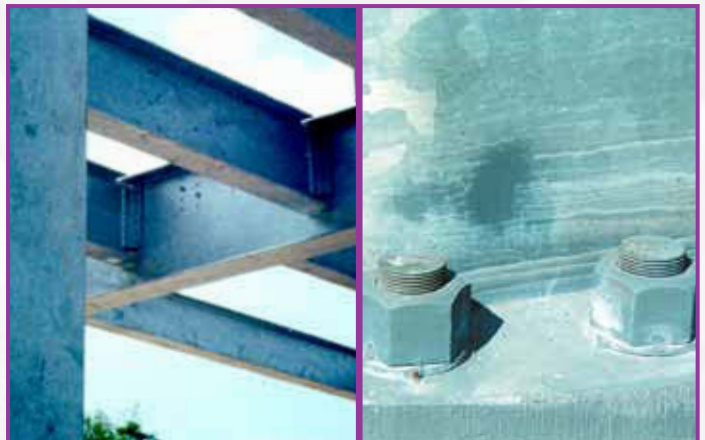
The zinc used in the hot-dip galvanized coating is a natural, healthy metal. As the 27<sup>th</sup> most abundant element in the earth's crust, zinc is readily available and renewable in addition to being 100% recyclable, along with the steel at the end of its service life. The natural, renewable, and durable zinc of the hot-dip galvanized coating will ensure renewable solar power can be generated without interruptions or impact to the environment.



**This galvanized solar energy center is the third largest in the world. It blends into the environment while harvesting renewable energy, minimizing environmental impact.**

## AESTHETICS

Solar projects have a wide array of applications, from the individual home owner installing them on top of their mid-century ranch style home, to the top level of a parking garage being converted into a miniature solar farm in the city. Keeping the structures corrosion free and aesthetically in line with the surrounding environment is a desirable characteristic of the finish that hot-dip galvanizing provides. The silver-gray appearance of the coating compliments many industrial installations and remains that way, without repairs or maintenance, for the project's entire service life. In a rural environment, a solar project benefits from the consistency of the coating and manages to stand out as a superior corrosion protection method while quietly blending into the surrounding environment, causing as little disruption as possible.



**The silvery-gray appearance of the HDG coating blends seamlessly into virtually any environment**

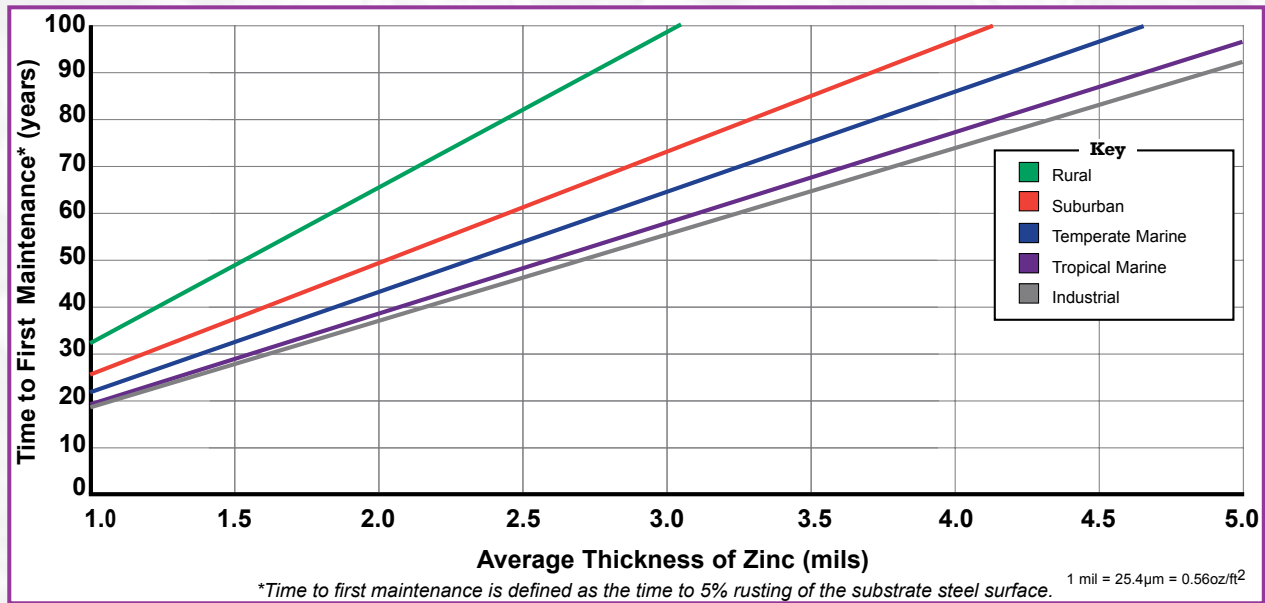


Figure 1: Time to First Maintenance Chart

## MAINTENANCE-FREE

Once installed, solar projects continually store the sun's energy. Constantly taking lines out of production for repairs to the substructure would be costly, time consuming, cause interruptions in operations, and waste additional energy. Solar projects are multi-million dollar investments, and when working at full capacity, will eventually recoup the costs of investment into the project. Galvanizing the substructures, frames, poles, fasteners, and other steel pieces involved in the construction of solar projects ensures they will function for decades with no maintenance, repairs, or touchups. The *Time to First Maintenance* chart (above) shows the thickness of zinc in five environmental conditions and how long the galvanized coating will last until maintenance is necessary. Hot-dip galvanizing ensures solar projects have the longest service life possible by protecting them initially and eliminating maintenance for the life of the project.

**“HDG lasts 75 years or more with no maintenance, which means no additional raw materials are used or emissions created once the structure is in use.”**

## DURABILITY

Hot-dip galvanizing can protect solar products with its unparalleled durability. Hot-dip galvanizing offers three levels of protection against corrosion. First, the hot-dip galvanized coating provides barrier protection. Zinc effectively isolates steel from the environment, therefore, allowing the steel to maintain its physical and chemical properties. The zinc-alloy intermetallic layers provide very good barrier protection, and unlike paint, has nearly impenetrable adhesion, with no flaking, cracking, or peeling.

In addition to barrier protection, the zinc in the galvanized coating also protects the steel cathodically. Zinc will sacrificially corrode to protect the underlying steel. Even if there is a small scratch or abrasion in the coating, the zinc will continue to protect the exposed steel. This is beneficial as many solar projects are constructed on site and have the potential to be damaged en route to the job site or while being assembled.

Another aspect of HDG that protects steel from corrosion is the zinc patina. Zinc, like all metals, begins to corrode when exposed to moisture and free-flowing air. The zinc patina forms when corrosion elements build up on the surface of the zinc, slowing the corrosion rate of the zinc. This is particularly useful for solar projects because the zinc patina offers nearly impenetrable protection from the elements. With the harsh, unforgiving climates and constant UV exposure that solar projects are subjected to, the durability of hot-dip galvanizing is unmatched.

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## LIFE-CYCLE COST

Solar projects, once constructed, are often in service for several decades or more. It is important to not only consider the initial cost, but also what the cost will be over the life of the project. Because galvanized steel is durable and maintenance-free the only cost incurred is during the initial construction of the project. The life-cycle cost calculator ([galvanizingcost.com](http://galvanizingcost.com)) allows you to compare the initial life-cycle cost of HDG to various paint systems. In most instances, the initial cost of galvanizing is comparable with those of paint systems, but over time, hot-dip galvanizing will deliver substantial saving, through deferred maintenance costs, repairs, and touchups. Maintenance costs, which can often be two to five times greater than the initial cost, can be avoided using HDG. This suggests the first priority in the analysis should be what the project will cost over its entire life. Utilizing hot-dip galvanizing in solar projects will protect the project and save direct and indirect maintenance costs for decades.



Without the need for future maintenance, these hot-dip galvanized solar panels will have a low life-cycle cost.

**Calculate the value of utilizing HDG in your next project - visit [www.galvanizingcost.com](http://www.galvanizingcost.com)**

## SUMMARY

Solar energy will continue to be a popular choice to meet rising energy demands, as solar energy is plentiful and renewable. Hot-dip galvanizing used in solar projects is a sustainable choice for corrosion protection because of its maintenance-free durability - saving millions over the life of the solar structure without repairs or touch-ups during the entire life of the project. Galvanized steel protects your investment and contributes to a sustainable future in energy production. Hot-dip galvanizing should be the choice for corrosion protection for the increasingly environmentally conscious population.



**Hot-dip galvanizing provides corrosion protection for renewable energy plants that protect the environment.**



### American Galvanizers Association

6881 South Holly Circle, Ste. 108  
Centennial, CO 80112

800.468.7732  
720-554-0900  
720-554-0909 (fax)

[www.galvanizeit.org](http://www.galvanizeit.org)  
[aga@galvanizeit.org](mailto:aga@galvanizeit.org)

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# Case Studies

## San Joaquin Solar Farm - Oakdale, CA

The South San Joaquin Solar Farm, which is one of the largest solar projects in the United States, is a 1.9 megawatt single-axis solar tracking system constructed to provide electricity to the De Groot Water Treatment Plant. In this forward-thinking, environmentally friendly project, 11,040 solar modules produce 3.7 million kilowatt hours of electricity output annually - enough to power 550 homes and offsetting nearly four million pounds of carbon dioxide emissions per year.

Nearly 9,000 pieces were galvanized on this project, and packaging and bundling were very important to maximize full truck loads from Los Angeles to the site in central California. A critical timeline had to be followed in order to coordinate fabrication and galvanizing in L.A. and transportation to the jobsite within two months. With the quick turnaround in the galvanizing process, the galvanizer was able to deliver parts to the jobsite in a timely manner for this environmentally conscious "green" project.



**San Joaquin Solar Farm will provide the local water treatment plant with energy uninterrupted by maintenance.**

This solar installation will transform San Joaquin into one of the "greenest" spots in California and will nearly wipe out the entire \$500,000 annual electricity bill the Irrigation Department pays to run their plant. As the need to "go green" continues, the need for hot-dip galvanizing on solar projects will undoubtedly continue to increase. Galvanized steel, in addition to saving the waste and expense of corrosion maintenance and repair, is also recyclable - making it an environmentally friendly choice that easily integrates with the intentions of the Solar Farm.

## Johnson & Johnson Solar Roof Panel System - New Brunswick, NJ

Johnson and Johnson required a coating that would be durable enough to withstand the harsh New England winters and provide maintenance-free protection for the solar project erected on the roof of a multi-level parking garage. They chose hot-dip galvanizing for those reasons and because it provides equal protection inside and out to the hollow, tubular structures. The galvanizing process includes total immersion of the steel in molten zinc which provides complete coverage inside and out, protecting the steel from the humidity and condensation that can occur on the inside of these structures. Not only does hot-dip galvanizing provide excellent corrosion protection and durability, the industrial aesthetics the silvery gray coating the zinc in the galvanized coating provides blends in with concrete, stainless steel and other industrial materials used in the surrounding area.



**The solar roof panel system above the Johnson and Johnson building is hot-dip galvanized to withstand New England's harsh weather conditions.**

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## Nevada Solar One, Solargenix Energy - Boulder City, NV

When constructed in 2006 in Nevada, the Solargenix Energy project was the third largest solar energy center in the world, and the largest capacity facility built in 15 years. The massive project covers 400 acres reflective with mirrors, which are computer-controlled to rotate to the most effective angle to the sun.

The desert location of the project means the hot-dip galvanized steel will be exposed to intense UV rays. Solargenix's past experience with hot-dip galvanized steel convinced them Maintenance-free galvanized steel was the most cost effective option for the facility. The 180,000 mirror panels will be capable of producing 64 MW of power. This renewable energy source has the potential to compete directly with conventional fossil fuel powered technologies, and is becoming a well-known alternative fuel source.

This project is a first in the United States of this size and magnitude, but larger projects are planned in Nevada and California. After the success of employing hot-dip galvanized steel in this project, it is expected that the additional plants will use galvanized steel as well. The durability and longevity provided by galvanized steel will ensure hot-dip galvanized steel will be a player in the expanding alternative energy market well into the future.



**Shining beautifully, this hot-dip galvanized Nevada solar farm utilizes the intense heat and sun of the desert.**



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[aga@galvanizeit.org](mailto:aga@galvanizeit.org)

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