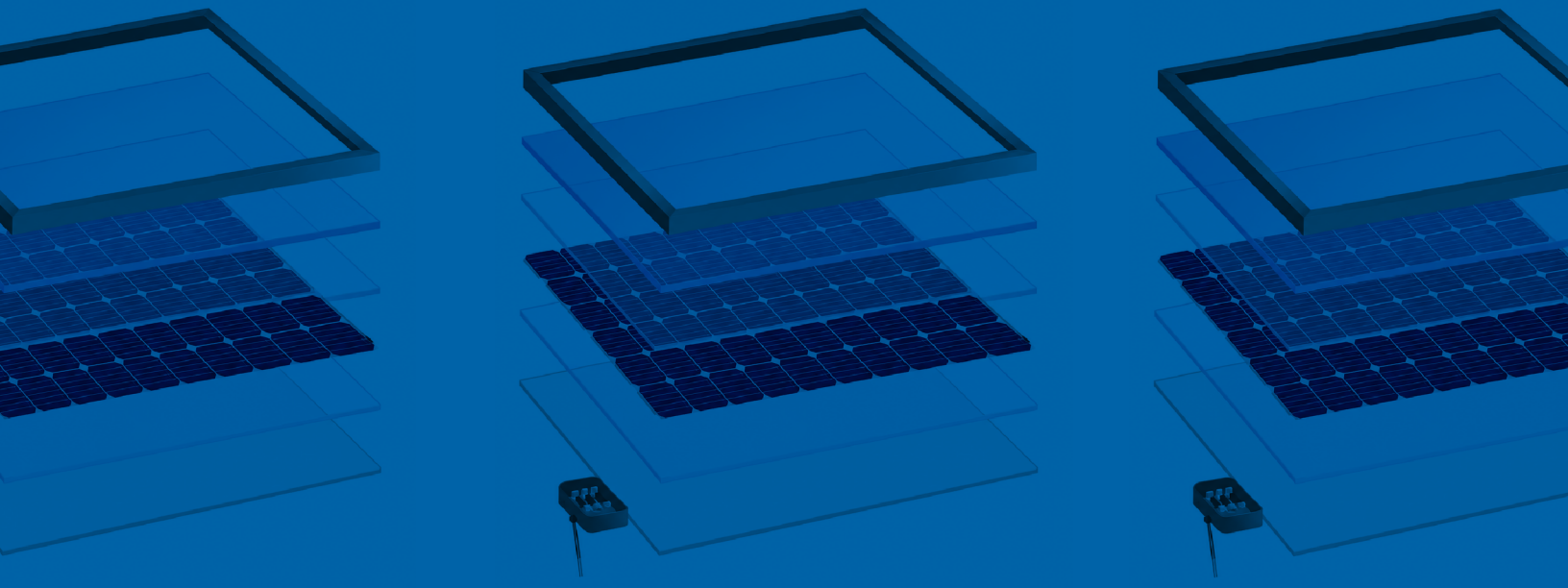
WHITE PAPER

Establishing a Standard for U.S.-Manufactured Aluminum Frames

Why Treasury and the IRS must clearly define U.S. origin for solar module frames under the Section 45Y / 48E domestic content bonus credit.



COALITION for a PROSPEROUS AMERICA

ALUMINUM EXTRUDERS COUNCIL

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June 29, 2026

The Honorable Scott Bessent
Secretary of the Treasury
U.S. Department of the Treasury
1500 Pennsylvania Avenue NW
Washington, DC 20220

Dear Secretary Bessent:

On behalf of the Coalition for a Prosperous America (CPA) and the Aluminum Extruders Council, we respectfully submit the enclosed white paper, "Establishing a Standard for U.S.-Manufactured Aluminum Frames," for your consideration.

The domestic content bonus credit under IRC Sections 45Y and 48E was enacted to rebuild domestic manufacturing capacity and reduce dependence on foreign supply chains. For solar module frames, the most capital-intensive and transformative step in production is aluminum extrusion, the process that physically defines the product's form and cross-sectional profile.

In the absence of clear IRS guidance, most solar module manufacturers are claiming U.S. origin frames based solely on cutting to length and hole punching of foreign-extruded aluminum. These operations constitute "mere assembly" under the Buy America Rules that Congress incorporated into the statute. The result is that the most significant manufacturing investment, extrusion, continues to occur overseas, while companies nonetheless claim the domestic content bonus.

CPA and the Aluminum Extruders Council urge Treasury and the IRS to issue guidance clarifying that extrusion must be performed in the United States for a solar module frame to qualify as a U.S.-produced manufactured product component. This standard is supported by the plain text of the statute, Buy America Rules, and Department of Commerce AD/CVD scope definitions, three independent bodies of law that reach the same conclusion. It is also the standard most faithful to what Congress intended: bringing real, capital-intensive manufacturing back to the United States.

Clear guidance will level the playing field for manufacturers who have already invested in domestic extrusion, protect compliant taxpayers from legal risk, and give the entire supply chain the certainty it needs to make long-term investment decisions.

We welcome the opportunity to discuss this matter further at your convenience.

Establishing a Standard for U.S.-Manufactured Aluminum Frames

Recommendation

Treasury and the IRS should issue regulations or other guidance with respect to solar module frames to clarify the meaning of "produced in the United States (as determined under the [Buy America Rules])" as described in section 45(b)(9)(B)(i) and section 45Y(g)(11)(B)(i) of the Internal Revenue Code of 1986, as amended (the "**Code**") for purposes of the domestic content bonus credit available generally under section 45Y and section 48E.

As described in further detail below, Congress explicitly required that "produced" be interpreted for purposes of the domestic content bonus credit under the Buy America Rules (as defined below) of the Federal Transit Authority ("**FTA**"). Treasury and the IRS should clarify that, for aluminum frames, the extrusion of aluminum billet must be performed in the U.S. for a frame to be "produced" in the U.S. Extrusion of aluminum billet generally is the first step in the frame production process and is explicitly identified under FTA guidance as constituting more than "mere assembly."

Absent clarifying guidance, market actors are applying inconsistent interpretations of the "produced" standard to aluminum frames. Most manufacturers are claiming U.S.-origin aluminum frames based solely on the cutting to length and hole punching in the U.S. of foreign aluminum extrusions. However, cutting to length and hole punching are not sufficient processing under the Buy America Rules for downstream frames to be deemed "produced" in the U.S.

Explicit clarification of this domestic production requirement would provide taxpayers with helpful guidance while preventing certain taxpayers from running afoul of a perceived ambiguity in the tax law. While public guidance (*e.g.*, Treasury regulations, an IRS revenue ruling, an IRS notice, or FAQs) would provide the clearest signal to taxpayers, even a private letter ruling addressed to a single taxpayer could still send a signal to supply chain participants as to how these rules should be interpreted.

Executive Summary

Under existing statute, a domestic content bonus credit can increase a qualified solar project's Investment Tax Credit (ITC) under Section 48E or a project's Production Tax Credit (PTC) under Section 45Y by 10 percentage points—a financial incentive significant enough to reshape procurement decisions across the entire U.S. solar supply chain. To claim this bonus, project owners must demonstrate that their solar modules contain the required percentage of manufactured product components ("**MPCs**") "produced" in the U.S. Calculation of the domestic content percentage for a solar module is guided by the applicable safe harbor assigned cost percentage table for each identified MPC that is used in manufacturing the module.

For solar module manufacturers operating in the U.S., the aluminum frame—a structurally integral component of virtually every crystalline silicon PV module—has emerged as a valuable component in the domestic content calculus. Under IRS Notice 2025-08, the frame/backrail of a PV module carries an assigned cost weight of 4.0% to 8.5% toward the domestic content percentage, making it potentially decisive for projects nearing the required threshold.

Accordingly, the question arises as to whether a U.S.-based manufacturer that imports aluminum extrusions produced outside of the U.S. and performs some, or all, of the subsequent processing steps domestically, can claim the frame as a U.S.-produced MPC. The lack of clear IRS guidance has led some solar module manufacturers to interpret the law in their ocwn best interest. This has led to under-investment in substantive frame manufacturing in the U.S., as the most capital-intensive step—extrusion—is being performed at existing factories overseas, but manufacturers are nonetheless still claiming domestic "production."

1. Background

1.1 The Policy Intent

When Congress reformed the Investment Tax Credit in August 2022, the domestic content bonus credit was designed to ensure the deployment of new energy projects and rebuild a domestic energy manufacturing base that had been hollowed out over the preceding decades, largely by Chinese competition. By tying a significant financial incentive to the domestic origin of components, lawmakers sought to create a direct market signal to pull manufacturing investment back to the U.S.

1.2 The Two-Track Domestic Content Test

The 45Y/48E domestic content bonus credit, as clarified through IRS Notices 2023-38, 2024-41, and 2025-08, operates on two parallel tracks:

- **Track 1 — Steel and Iron:** Any component of an applicable project that is primarily made of steel or iron and is structural in function (*e.g.*, pile foundations, steel rebar) must have undergone all manufacturing processes in the U.S. This is an absolute, 100% standard. No safe harbor percentages apply; either all manufacturing steps occur in the U.S. or the item fails.
- **Track 2 — Manufactured Products:** Deployment of a manufactured product (MP), such as a solar module, and its components (manufactured product components or MPCs) must collectively meet a minimum "domestic cost percentage." Among the key components in this calculation is the frame used on the solar module. Overall, the domestic cost percentage threshold is set at 40% for solar projects that began construction before June 16, 2025, rising to 45% between June 16, 2025, and December 31, 2025, 50% in 2026, and 55% in 2027 and beyond.

Critically, the statute cross-references the FTA rules for the technical definition of what it means to be "produced in the United States." Congress adopted this definition for tax purposes under section 45(b)(9)(A) (*i.e.*, the domestic content bonus credit), which provides that any steel, iron, or manufactured product will be treated as "produced in the United States (as determined under section 661 of title 49, Code of Federal Regulations)" (the "**Buy America Rules**"). Under those rules, a manufactured product component is considered U.S.-produced if it undergoes in the U.S. the "manufacturing process," which is defined to mean, "the application of processes to alter the form or function of materials or of elements of the product in a manner adding value and transforming those materials or elements so that they represent a new end product functionally different from that which would result from mere assembly of the elements or materials." 49 CFR § 661.3.

2. Aluminum Frame Manufacturing

2.1 What Is a Solar Module Frame?

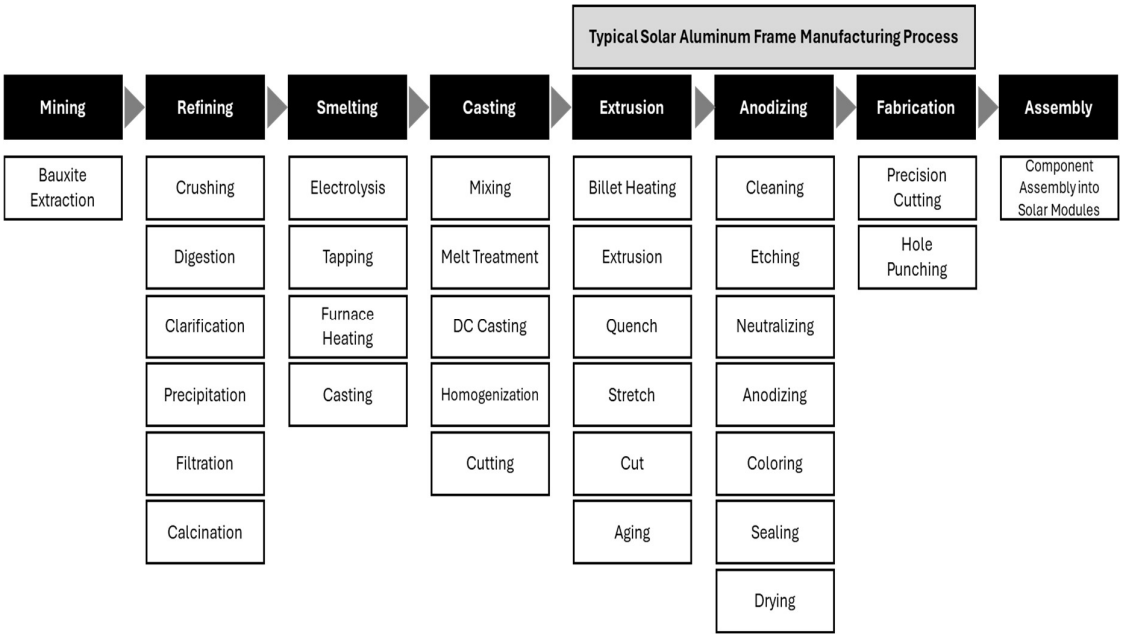
A solar module frame is the structural border surrounding the laminated cell assembly — the glass, encapsulant, cells, backsheet, and junction box. It provides mechanical protection, enables mounting to racking systems, and facilitates grounding. Aluminum is an overwhelming material of choice due to its high strength-to-weight ratio, corrosion resistance, and compatibility with anodizing for long-term outdoor durability. The frame must survive 25–30 years of outdoor exposure, thermal cycling, wind and snow loads, and humidity — a demanding performance envelope that no cosmetic or structural shortcut can satisfy.

2.2 The Three-Stage Manufacturing Process

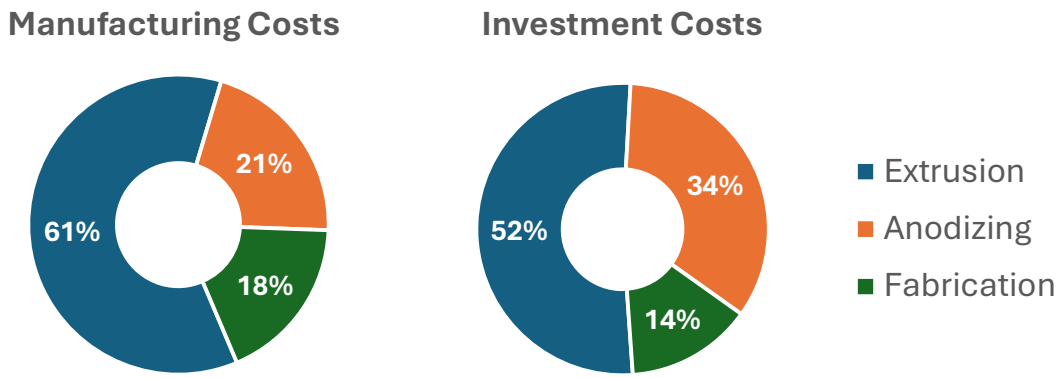
Aluminum frame production consists of three sequential steps. To exploit comparative advantages, each step might be completed in a separate country.

- **Step 1 — Extrusion.** High-purity aluminum ingots are melted and cast into cylindrical billets, which are then heated and forced through precision-engineered dies under high pressure. The die determines the cross-sectional profile (*i.e.*, the specific shape of the frame's flange, web, groove, and channel geometry). The extruded profile is then cooled, straightened, and cut into standard lengths for downstream processing. Extrusion is capital-intensive: a commercial press costs several million dollars, requires significant floor space and energy infrastructure, and demands skilled operators. Die tooling is custom designed to each manufacturer's module specification.
- **Step 2 — Anodizing.** Extruded profiles undergo anodizing — an electrolytic oxidation process that builds a durable aluminum oxide layer on the surface, providing corrosion resistance, UV protection, and a uniform matte finish. Anodizing is a functional requirement for long-term outdoor performance certification under IEC 61215. Without anodizing, bare aluminum profiles would oxidize unevenly in the field, compromising both performance and customer acceptance.
- **Step 3 — Fabrication.** Anodized profiles are cut to the lengths required by the module format using high-speed precision saws. Additional operations include hole punching (e.g., drainage holes, grounding slots, and mounting points) and edge finishing, followed by interconnecting four frame profiles.

A visual interpretation of the entire aluminum frame manufacturing process is as follows:



Additionally, the aluminum frame manufacturing process can be understood in terms of the cost of each of the steps described above, as follows:



As shown above, the majority of the manufacturing costs (*i.e.*, processing costs) and investment costs (*i.e.*, capital expenditures) of an aluminum frame are attributable to extrusion. In requiring over half of all frame manufacturing expenditures, it is reasonable to consider that domestic content requirements would mandate that extrusion occur in the U.S. As discussed below, unfortunately, supply chain participants are taking inconsistent positions as to when "production" occurs and is discussed in further depth below.

3. Market Practices

3.1 Overview

In the absence of definitive IRS guidance on what constitutes a "manufacturing process" sufficient to confer U.S. origin on an aluminum solar module frame, versus what constitutes "mere assembly," market participants have developed their own interpretations — often shaped more by commercial interest than by legal certainty. The result is a fragmented landscape in which manufacturers claiming the domestic content bonus credit are relying on materially different process thresholds, ranging from full domestic extrusion to fabrication-only operations.

3.2 Module Manufacturer Positions

The table below summarizes the varying approaches for solar module frames taken by each major U.S. module manufacturer (as determined through independent research) when considering the domestic cost percentage of a solar module. The list includes each manufacturer's frame vendors and the key facts observed through direct engagement and on-site due diligence.

Module Manufacturer	Frame Vendor	Remark
Manufacturer A	Vendor 1 and Vendor 2	• Manufacturer A is currently operating a dual-vendor strategy, sourcing from both Vendor 1 and Vendor 2, both of which perform solely **cutting/hole punching** in the U.S. • On-site due diligence at Vendor 1 confirmed the existence of a supply contract with Manufacturer A and the presence of an extrusion die for Manufacturer A's frame profile on-site **in Canada**. • Performs only fabrication (*i.e.*, Step 3) in the U.S.

Module Manufacturer	Frame Vendor	Remark
Manufacturer B	TBD (planning on using domestic frames from Aug 2026)	• Manufacturer B is still evaluating domestic frame supply options and is also exploring steel frame alternatives. The company's current internal position is that U.S.-based **cutting/drilling** alone is sufficient to establish DCA eligibility. • Will perform only fabrication (*i.e.*, Step 3) in the U.S.
Manufacturer C	Vendor 1 and Vendor 3	• Sourcing from two vendors, both of which perform **cutting/hole punching** domestically. • Performs only fabrication (*i.e.*, Step 3) in the U.S.
Manufacturer D	Vendor 1	• Manufacturer D maintains that products undergoing only **cutting/hole punching** in the U.S. qualify as U.S.-manufactured, based on a Certificate of Origin issued by Vendor 1. However, the company has acknowledged that the certificate contains no indemnification clause in the event the product is later determined to be non-U.S. origin. • Manufacturer D further understands that if extrusion is performed domestically, U.S. origin is established without any additional documentation. • Performs only fabrication (*i.e.*, Step 3) in the U.S.
Manufacturer E	Vendor 1	• On-site due diligence at Vendor 1 confirmed the existence of a supply contract with Manufacturer E and the **presence of an extrusion die** for Manufacturer E's frame profile on-site **in Canada**. • Performs fabrication (*i.e.*, Step 3), and possibly extrusion (*i.e.*, Step 1), in the U.S.

Module Manufacturer	Frame Vendor	Remark
Manufacturer F	Vendor 3	• Both companies confirmed through direct meetings that they are currently sourcing frames where only **cutting/hole punching** is performed in the U.S. This position is based on an interpretation provided by external legal counsel retained by each company. • Perform only fabrication, (*i.e.*, Step 3) in the U.S.
Manufacturer G	Vendor 3	
Manufacturer H	Vendor 4	• Argues that performing the **anodizing process** within the U.S. is the essential criterion for establishing U.S.-origin material status. • Performs only anodizing (*i.e.*, Step 2) in the U.S.
Manufacturer I	Vendor 5	• Extrusion must be performed in U.S. (because extrusion is explicitly identified by FTA as constituting more than "mere assembly"). • Performs extrusion, anodizing, and fabrication (*i.e.*, Steps 1, 2, and 3) in the U.S.

3.3 Claimed Manufacturing Process by Manufacturer

The following table summarizes each manufacturer's first U.S. step in the manufacturing process.

Step at Which U.S. Processing Begins	Module Manufacturer
Step 1 - Extrusion	Manufacturer I
Step 2 - Anodizing	Manufacturer H
Step 3 – Fabrication	Manufacturers A through G

3.4 Frame Vendor Positions

Frame vendors also hold distinct and consequential views on what constitutes U.S. origin, as they are the entities issuing origin certifications upon which module

manufacturers' domestic content claims ultimately rest.

Vendor	Customers	Remark
Vendor 1	Manufacturer A, Manufacturer D, Manufacturer D, Manufacturer E	• Vendor 1 relies on "tariff shift" legal standard, argues for U.S. content eligibility on the basis that a tariff classification change occurs **after U.S. cutting/hole punching** operations, as recognized by U.S. Customs and Border Protection (CBP). Specifically, imported aluminum extrusions and corner brackets enter under HTSUS 7604.21.0010 and 7616.99.5190, respectively, while the finished solar frame is reclassified as HTSUS 8541.90.0000 upon completion of fabrication. Vendor 1's position is that this tariff shift, combined with a change in end-use, is sufficient to establish U.S. origin and is using a letter from a county official as the legal basis for its U.S. origin certification. • The company has also leased additional facility space to fulfill a growing order and is currently in equipment procurement for that expansion.
Vendor 3	Manufacturer C, Manufacturer E, Manufacturer F, Manufacturer H, Manufacturer J, Manufacturer K, Manufacturer L, Manufacturer M	• Vendor 3 **does not take a position** on what the appropriate more than "mere assembly" standard should be; instead, it produces what customers specify and issues certifications accordingly. • Notably, Vendor 3 filed for Chapter 11 bankruptcy protection on January 20, 2026, introducing material supply continuity risk for the numerous module manufacturers in its customer base.

3.5 The Cost Barrier to Domestic Extrusion

The predominance of fabrication-only domestic supply chains is not primarily a legal choice — it is an economic one. The cost differential between fully domestic frame production, versus offshore extrusion and offshore anodization with domestic cutting/hole punching is substantial enough to make full onshoring

commercially unattractive for most manufacturers under current market conditions.

4. Why Extrusion Must Occur in the U.S.

4.1 The Regulatory Case

The question of which manufacturing processes confer U.S. origin on an aluminum solar frame, and which constitute "mere assembly," is not answered by IRS guidance alone. It requires reading three bodies of law together — and when read together, the law points in one direction: extrusion is the essential, origin-conferring manufacturing step, and without it, a domestic content claim for the frame is not justified.

4.1.1 IRS Notice 2023-38 Requires More than "Mere Assembly"

Under the IRS Notice, a module frame is a manufactured product component (§ 3.04 Table 2), and "is considered to be of U.S. origin if it is manufactured in the United States" (§ 3.03(1)). "Manufactured" means produced as a result of the manufacturing process, which requires: "the application of processes to alter the form or function of materials or of elements of a product in a manner adding value and transforming those materials or elements so that they represent a new item functionally different from that which would result from mere assembly of the elements or materials." (§ 3.01(2)(e)).

Extruding aluminum alters its form, from a cylindrical billet to an extrusion of a particular cross section. Extruding also alters function. A billet has an indeterminate function and can be processed into a range of products, from fighter jets to soda cans, whereas a frame extrusion has a purpose-built cross-section designed to meet solar module frame performance requirements.

Moreover, extrusion is the *only* step that clearly constitutes "manufacturing" under Notice 2023-28. Fabrication (*i.e.*, Step 3) is mere assembly, and anodizing (*i.e.*, Step 2) does not change the form of an extrusion and or alter its function.

4.1.2 Section 45 defines "produced in the United States" by referencing the Buy America Rules. The FTA explicitly names extrusion as a manufacturing process that is more than "mere assembly."

IRS Notice 2023-38 defines a "manufacturing process" by incorporating the Buy America Rules, which requires the application of processes that "alter the form or function of materials or of elements of a product in a manner adding value and transforming those materials or elements so that they represent a new item functionally different from that which would result from mere assembly of the elements or materials." Guidance from the FTA's predecessor (56 Fed. Reg. 926, 929) identifies the specific processes that constitute genuine manufacturing — as distinct from mere assembly. That list explicitly includes: "forming, ***extruding***, material removal, welding, soldering, etching, plating, material deposition, pressing, shot blasting, brushing, grinding, lapping, [and] finishing," among others. *Id*.

Extrusion is listed. Cutting to length is not. Neither is punching holes. Although "material removal" is listed, the FTA has determined that hole punching or drilling holes constitutes mere assembly. *In re Milwaukee County Transit System* (FTA 2010) (drilling holes, connecting components, and applying decals are, collectively, mere assembly and do not constitute a "manufacturing process").

The FTA distinctions are not incidental. The FTA's enumeration of origin-conferring processes was deliberately constructed to identify transformative operations — those that alter the fundamental form or function of a material. Forcing a heated aluminum billet through a precision die at high pressure to produce an engineered cross-sectional profile is precisely the kind of transformation the FTA had in mind. Cutting that profile to length and punching holes in it is not.

4.1.3 For Department of Commerce AD/CVD purposes cutting and hole punching are not manufacturing.

The Department of Commerce's scope definition for the Aluminum Extrusions AD/CVD orders (Case No. 2011-13086, 76 FR 30650) provides a critical interpretive anchor. Commerce defines aluminum extrusions as shapes and forms produced by an extrusion process — and explicitly states that the scope covers aluminum extrusions regardless of form, finishing, or fabrication, whether assembled or unassembled, whether coated, painted, anodized, or thermally improved.

The implication is direct and consequential: in the eyes of the U.S. government's trade enforcement framework, anodizing (*i.e.*, step 2) and fabrication (*i.e.*, step 3) are downstream operations applied to an extrusion. They do not change the fundamental character of the product. An anodized, cut, and punched aluminum frame profile is still, for Commerce's purposes, an aluminum extrusion — the product of wherever the extrusion occurred.[1]

If anodizing and fabrication do not change the product's character sufficiently to take it outside the scope of an aluminum extrusion trade order, it is difficult to argue, for example, that those same operations are sufficient to transform a Vietnamese extrusion into a U.S.-manufactured solar frame component for IRA domestic content purposes.

4.2 The Three-Source Convergence

The following table summarizes how each regulatory source supports the conclusion that domestic extrusion is required.

[1] To avoid any possibility of confusion, Treasury and the IRS should also explicitly state that anodizing and fabrication do *not* constitute manufacturing processes of an aluminum solar frame.

Document	Paragraphs	Implication for Frame Origin
IRS Notice 2023-38 (incorporating FTA 49 C.F.R. § 661.3)	• Manufacturing process must add value and transform materials into a new item functionally different from mere assembly	• Cutting and punching a pre-formed profile does not meet this threshold; extrusion does
FTA Buy America (56 Fed. Reg. 926)	• Explicitly lists "extruding" as an origin-conferring manufacturing process; does not list cutting-to-length or hole punching.	• Extrusion is the process that establishes U.S. manufacture; fabrication alone is not sufficient
DOC AD/CVD Scope (76 FR 30650)	• Aluminum extrusions remain subject merchandise regardless of anodizing, finishing, or fabrication performed downstream	• Downstream operations do not transform the product's essential character; the extrusion step defines the product's origin

4.3 The Right Direction for the Market

Clear guidance is needed from the IRS to ensure a level playing field. Domestic extrusion is required to establish a legally defensible U.S.-origin claim for an aluminum solar frame. This is not simply a conservative legal interpretation. It is the interpretation consistent with the text, structure, and policy purpose of the IRA's domestic content regime.

The tax incentive was designed to bring real manufacturing back to the U.S. Extrusion is real manufacturing. It requires capital investment in heavy industrial equipment, a skilled domestic workforce, custom die tooling, and ongoing technical operations. It is exactly the kind of activity the domestic content bonus was enacted to incentivize.

A compliance pathway that allows a module manufacturer to import a Chinese-extruded profile and merely perform cutting to length and punching holes in a U.S. warehouse — and then to certify the frame as a U.S.-Manufactured Product Component — does not serve the purpose of the law.

The industry needs guidance that matches the policy. Requiring extrusion to occur in the U.S., regardless of where subsequent anodizing takes place, represents the standard most likely to withstand legal scrutiny and the standard most faithful to what Congress intended.