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# **It's Decommissioned, Now What? Solutions for Removed Solar PV Material**

Saxon Metzger

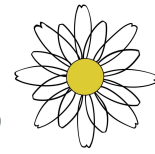
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# Introduction - Material Matters

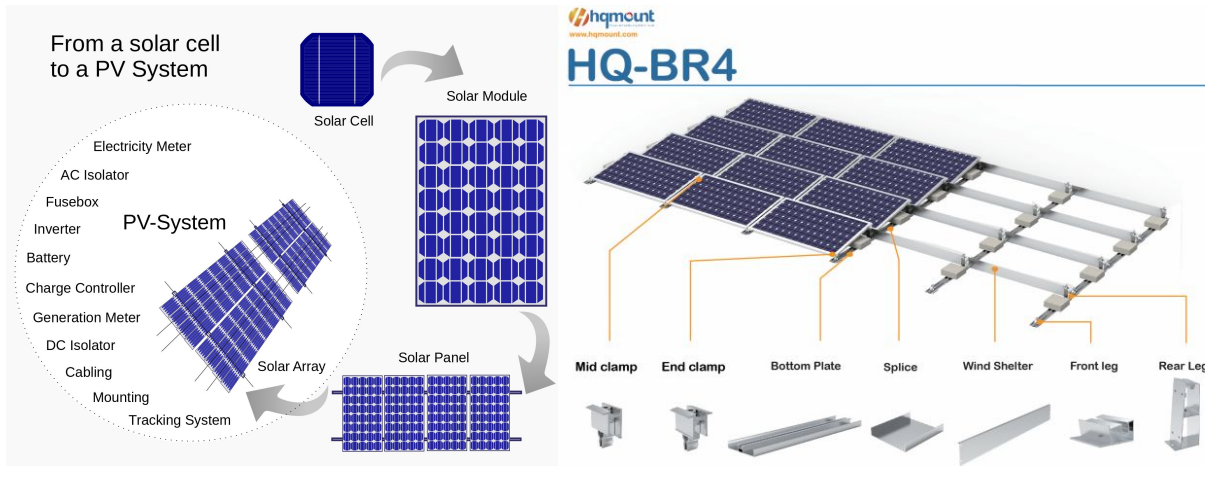
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- Goals:
  - Explain current and future supply chains of individual components of Solar PV assets from decommissioned sites
  - Provide insight into repurposing, resell, and other landfill diversion strategies.
  - Clarify how different materials and manufacturers create unique opportunities and challenges



# How Much Material Are We Talking About?

- Incredibly complicated supply chains
- Total weight estimate? Varies widely, but HIGH. 40-50+ pound per panel, and equal or exceeding weight for everything else.



# Further Complications



Conduits are generally made of plastic or metals. These protective pipes are classified as

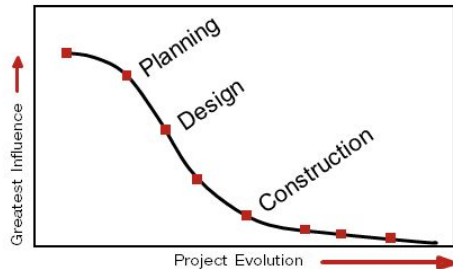
- ◆ Rigid steel conduit: Strongest type of conduit, resembles a strong pipe
- ◆ Electrical Metallic tubing: 40% thinner than rigid steel conduit. Easier to bend and less durable
- ◆ Rigid non-metallic PVC conduit: Made up of rugged plastic. They are used for underground installations. Plastic conduits of this type are cheaper and strong.
- ◆ Flexible metallic conduit: Generally steel or aluminum is used to make these conduits. They are fixed in areas where there is an expectation of movement or vibration.

- How many separate materials?
  - Panels
  - Concrete: ballasts and pads
  - Electronics: Inverters, comms box, RSS, combiners, switchgears,
  - Plastic: Rigid
  - Racking and structural metal: typically aluminum, steel, sometimes plastic or rubber elements
  - TPO or other roofing material for slip sheets
  - Wiring: Bare copper wires, PVC wrapped wires, aluminum or steel flex conduit enclosures
- Factored in removal?
  - Pallets
  - Banding
  - Straps
  - Supplies and waste from construction crew

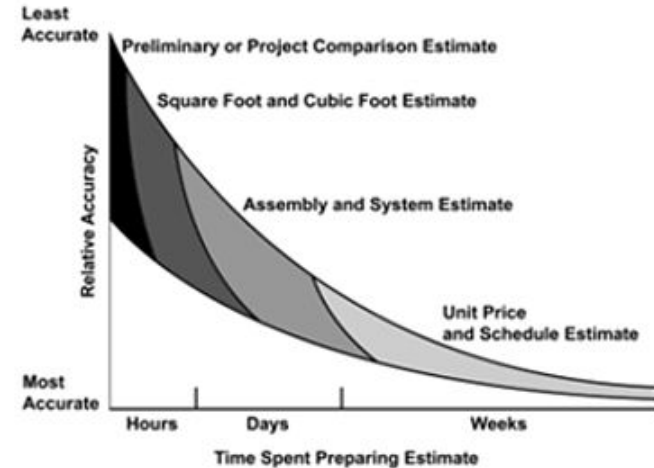
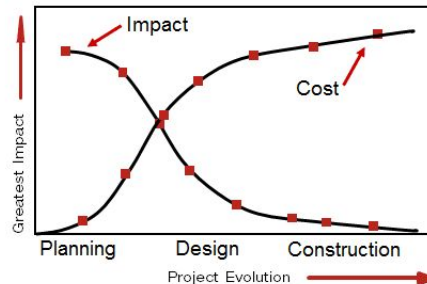
# Best Time to Plan?

- Before you've even estimated the price of a project
- What happens if you don't?
  - Excess onsite storage of material
  - Bad estimates
  - Last minute pricing
  - Reduced project efficiencies
  - Frustrated clients
  - Bad press and bad photos

Ability to Influence Outcome

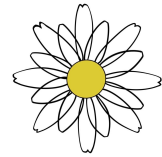


Ability to Influence Cost



# Types of Material to be Decommissioned

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## Material People Buy from You

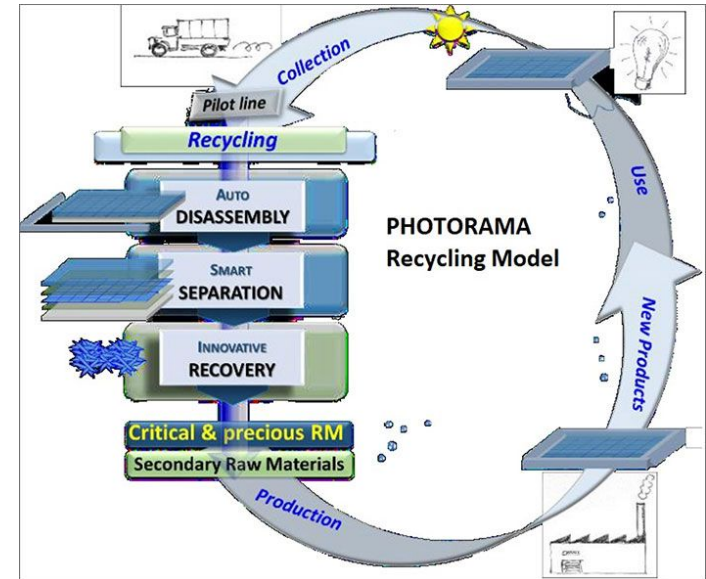
- Some panels!
  - Greater than 300w and in good condition
- Some racking
  - More expensive than it was new!
- Combiners and electrical panels
- Most racking and conduit
  - Some separation is key here

## Material You Pay Folks to Take Away

- Inverters, RSS, - E-Waste you pay to recycle
  - Exception: salvageable parts, or if there's immediately nearby need
- Anything rubber or plastic
  - Slip Sheets
- Ballast
  - Concrete pads for EBOS as well
- Attachment points
  - Exception: Can it be reused and under warranty?
- Pallets
  - Panels arrive on pallets and leave on pallets

# Recycling

- Won't focus heavily here, but there's good news
  - Approximately 40% of all new panels could be made with old panels
- Recycling is not the only or best option for every situation
  - Is the material really ready to be recast?
- It's getting better!
  - Take Back Programs from module manufacturers
- Recycling beyond the panels:
  - Metal and E-Waste: Separated and sold
  - TPO melted and reformed
  - Pallets to mulch
  - Concrete
    - Aggregate
    - Erosion control
    - New concrete additive
    - Utility pipe bedding



# Reduce

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- By the time solar is installed, most material is committed
  - Later presentation will review lessons learned to help our future decommissioning contractors!
- Removing solar from a roof does require excessive material, and risks issues
  - Construction site waste
  - Causes:
    - Lack of knowledge of demolition contractors
    - Wasteful use of materials on-site
    - Inappropriate packaging
    - Low quality of buildings materials
    - Inappropriate methods for handling on-site
    - Inefficient procurement
    - Inappropriate inventory
    - Inappropriate methods for shipment
    - Frequent demolitions
- Solutions?
  - Reusable pallets, straps, banding
  - Water jugs and sustainable packaging for any meals provided
  - Training!





# Reuse Solutions

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- Can you or a partner organization use these for O&M or R&R projects?
- Can you donate these to a worthy cause?
- Can you resell these to recoup costs?
  - Going it alone?
  - Marketplaces
- Special Cases:
  - Art
  - Rural or indigenous community microgrid

# Examples of Repurposed Panels - Art

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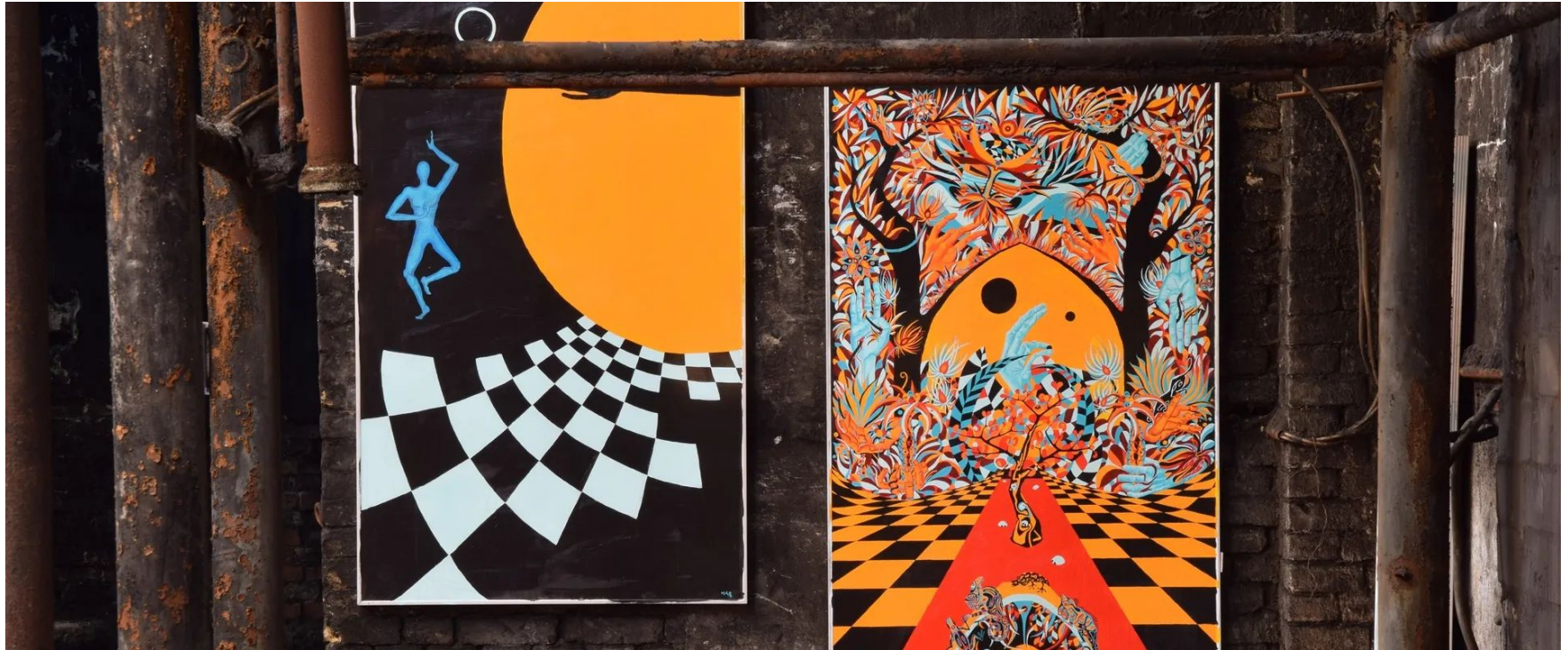
Artist: Cruz Ortiz

<http://www.cruzortizart.net/>

Fully functional panel, celebrating San Antonio's recognition as the National Wildlife Federation's first Monarch Butterfly Champion City,

# Examples of Repurposed Panels - Art

Artist: Abou Aboughazala



# Examples of Repurposed Panels - As a Building Block

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- In Spain, modules are a cheaper building material than fencing
- Are you even a solar company if you don't have one of these in your office?



# What Determines Reuse Possibility?

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- The reality of local logistics
  - International shipping is complicated and expensive even within free trade agreements
  - Domestic shipping harms project economics
- Your connections to the community and within the industry
  - Are you someone people know they can reach out to?
  - Are you someone who reaches out to others about what they have on hand?

# What Determines Reuse Success?

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- Can you service the equipment you are installing?
- How long will the material actually last? Warrantied?
  - Some material is only theoretically reusable
    - Wood breaks
    - Inverters/RSS/Combiners are sensitive equipment
  - Removing system components begins to void every warranty on the project
- What's the regulatory and permitting environment you are in?

# Reuse Avenues: Online Marketplaces Like EnergyBin

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- Excellent option for solar and storage solutions within the United States
- Requires membership
  - Reduces access but ensures a managed selling environment
- Some challenges
  - Ranges in terms of options based on region
  - Typically requires high quality and not particularly old modules to ensure really economically viable material sales



# Reuse Avenues: Charities

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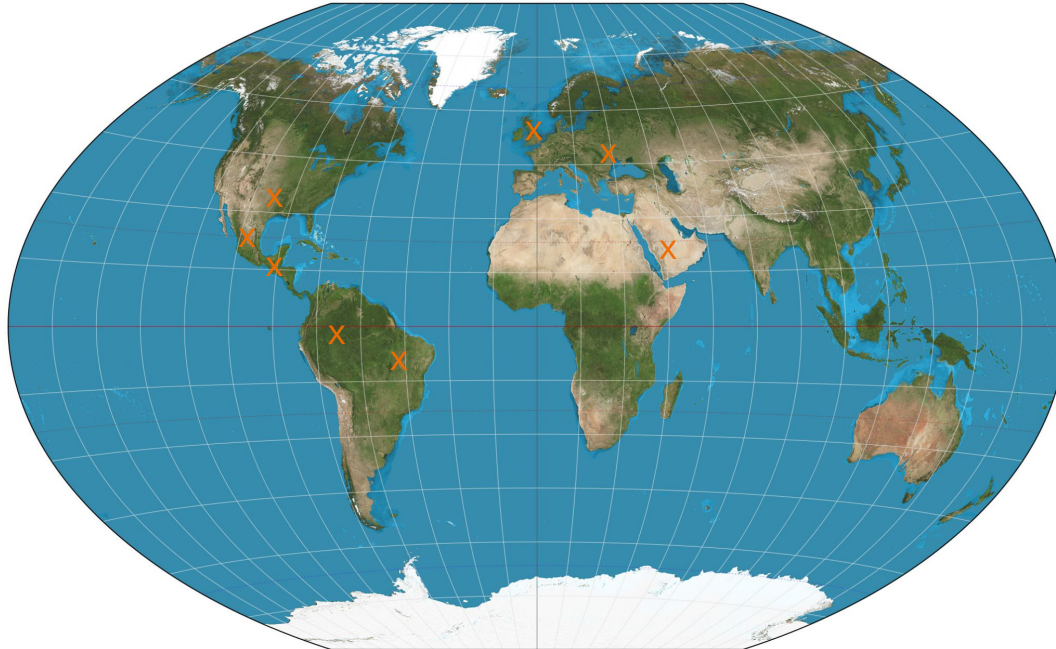
- Donated Labor?
- Tax incentive
- Potential openness to material that isn't brand new
- Creates great publicity
- Projects work: Apollo Energy and Grid Alternatives donated a 40kW system including installation to a multi-family building housing low-income veterans.
- Challenges?
  - Expertise is expensive, lack of expertise? More so
  - Is it cheaper to just buy it new with new tax incentives?
    - IRA passage



# The Places Your Material Will Go....

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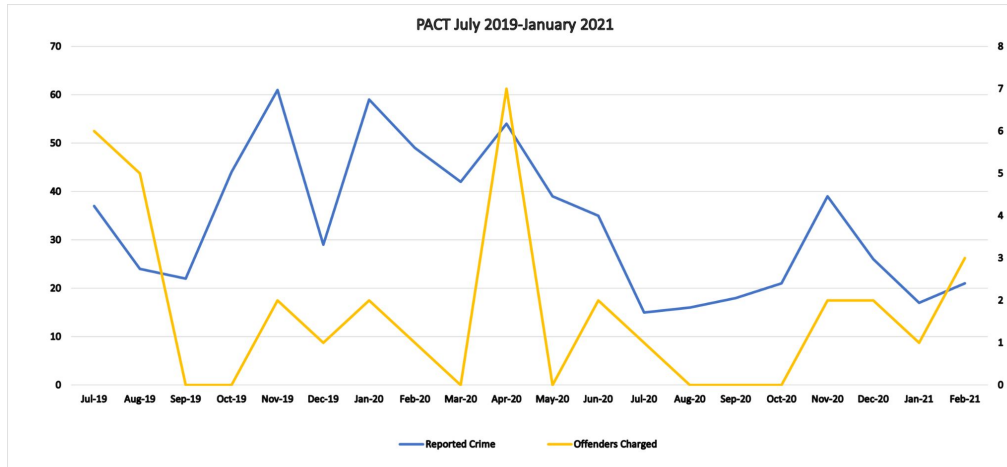
- Focusing on this kind of work builds relationships
- Relationships create local, regional, and international options



# Site and Labor Considerations: Security



- To sell material, it can't walk off!
- Stats:
  - DOE: \$1 billion in copper alone is stolen every year
  - Construction theft is estimated to cost \$400 billion
  - You won't get your stuff back
- Personal anecdote: construction sites



# Site and Labor Considerations: Labor Efficiency

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- Regardless of next steps, you'll have to consider how to remove from site.
- How much care will dictate speed
- Do you need different equipment?
- Do you need to band and strap, or just toss into a bin?



# How to Find Solutions

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- LinkedIn / Existing Professional Networks
- Be Patient
- Everyone Wants Quotes. Prioritize
- Review local options
  - Storage
  - Recycling centers
  - Regional construction and logistics partners

# Conclusion

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- Begin planning now!
- Are you responsible for Decommissioning?
- Have you confirmed your bond and estimates based on real quotes?

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**Questions?**

**— Thank You For Attending! —**

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