Energetic and thermodynamic analysis for plasma pyrolysis:

Reaction of EVA with Water

The reaction proceeds as follows:

$(C_2H_4)_n$+$(C_4H_6O_2)_m$ + mH_2O → $(C_2H_4)_n$(C2H4)m+(CH3COOH)m

Ethylene is recovered, and vinyl acetate breaks down into acetic acid.

Material Breakdown for 1 MW Solar Panels

Component	Percentage (%)	Mass (Kg)
Glass	76%	39368
Other Metals	11%	5180
Aluminium	8%	4144
EVA	8%	4144
PVF	2%	1036

EVA Composition and Breakdown

- EVA consists of:
    - **80% Ethylene (C2H4)**
    - **20% Vinyl Acetate (C4H6O2)**

Component	Percentage (%)	Mass (Kg)	Molar Mass (g/mol)	Moles
C2H4	80%	3315.2	28	118400
C4H6O2	20%	828.8	86	963

- Vinyl acetate fully breaks down into acetic acid (CH3COOH), yielding 963 moles of acetic acid.

Combustion Reactions and Energetics

1. **Ethylene (C2H4) Combustion**:

C2H4+3O2→2CO2+2H2OΔH=−1410.008 KJ/mol
Energy from 118400 mol=118400×−1410.008 KJ=−166.96 GJ

Total Energy Released:

167 GJ

Electricity Generated (Efficiency = 50 % considering that 20 % heat also lost while heating the water):

167 – 20% = 133.6 , almost 134GJ

133 * 0.5 = 67GJ

Energy Required for Plasma Pyrolysis

Argon Gas Ionization

Parameter	**Value**
Volume of Argon	2.12 m^3 (2120 L)
Moles (n)	87
Ionization Energy (731 KJ/mol)	63.59 MJ
Thermal Energy	16.27 MJ
Total Energy (Argon)	79.86 MJ

Energy for Metal Vaporization

Metal	**Mass (Kg)**	**Heat of Fusion (KJ/mol)**	**Heat of Vaporization (KJ/mol)**	**Total Energy (GJ)**
Si	2072	50.2	383	35
Cu	518	13.26	300.4	0.862
Ag	15	23.5	254	0.454
Pb	23	4.77	179.5	0.150
Ti	22	14.15	425	3
Sn	14	7.03	296.1	0.100

Total Energy for Metals:

(35 +3 + 0.862+0.454+0.150+0.100) GJ≈39.57 GJ

Energy for metals is calculated as:

[(From Room temperature (RT) to melting point(Tm)]

m*Cp(Tm – RT) + Heat of fusion + m*Cp(Tb-Tm) + heat of vaporization

Final Energy Requirements

Component	**Energy (GJ)**
Electricity generated	**67GJ**
Plasma Pyrolysis Energy (Required)	**39.57**
Net Energy Available	**27.43**

Let me know if any further refinement is needed!