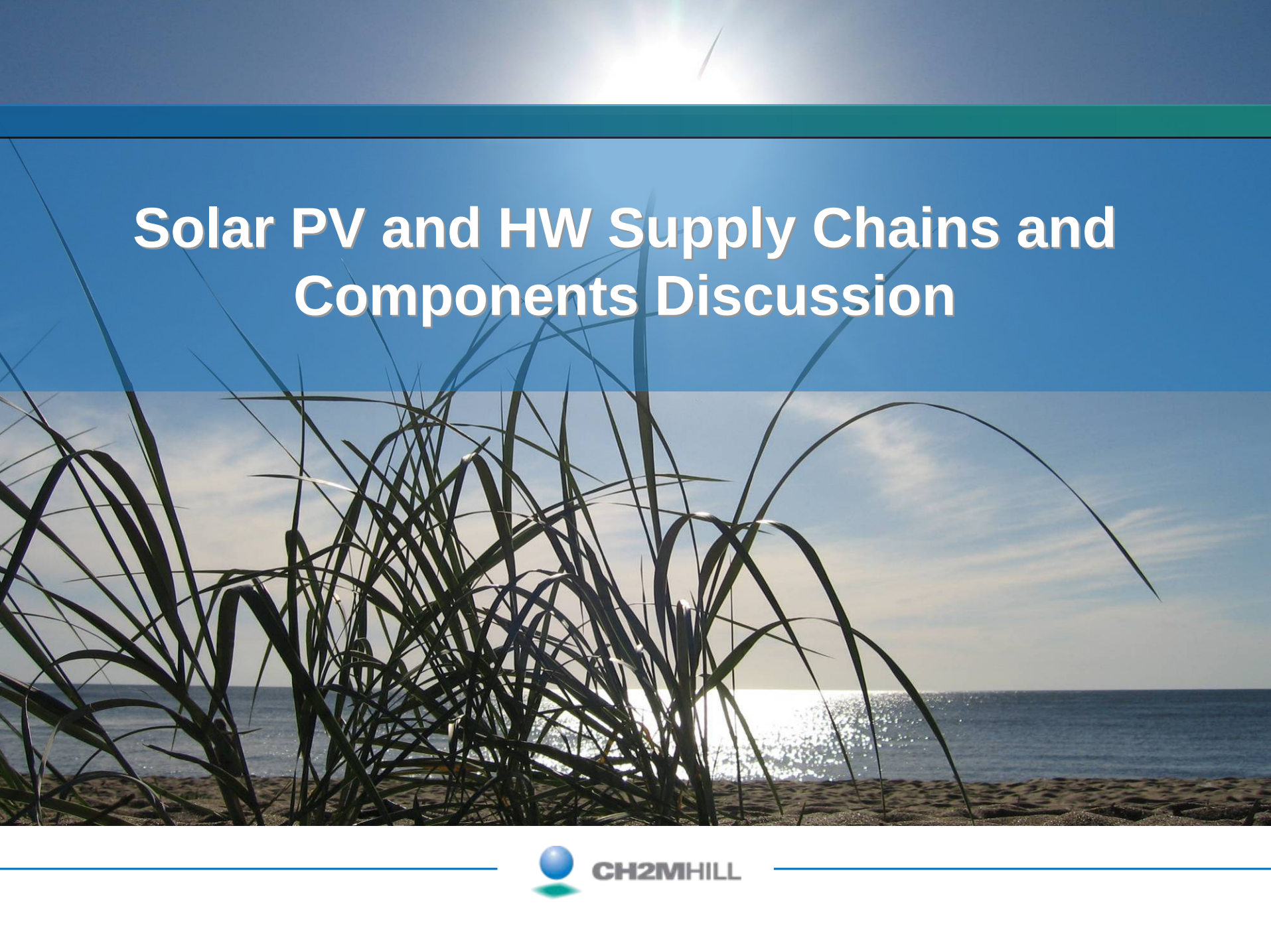


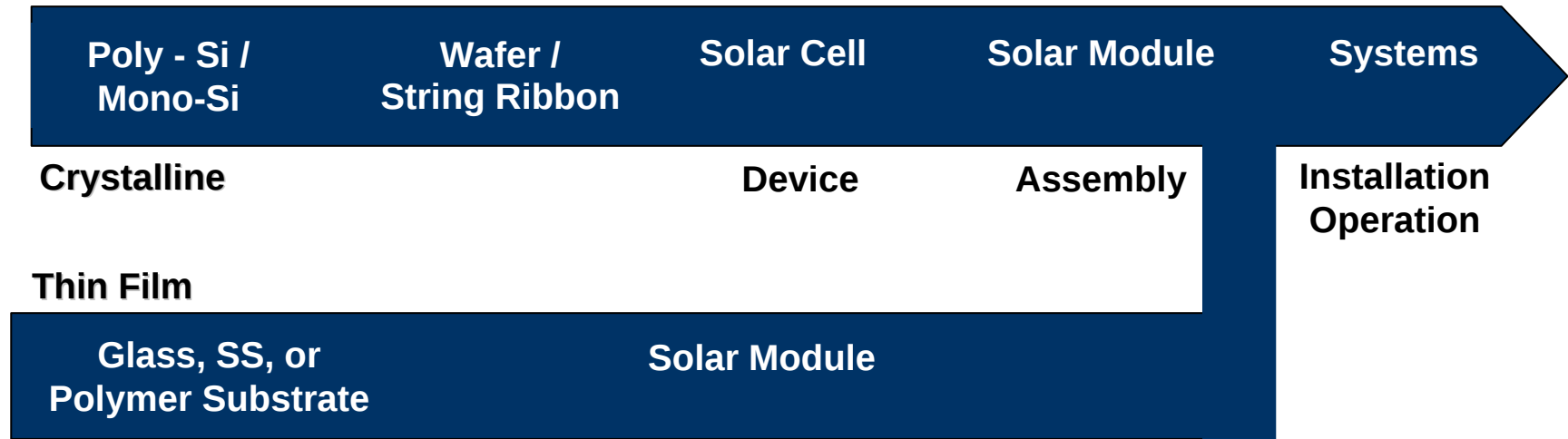
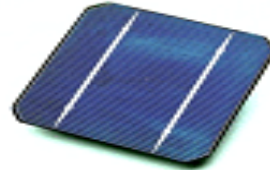
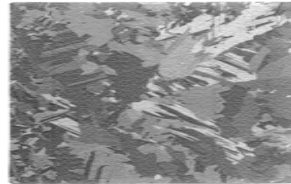


Solar PV and HW Supply Chains and Components Discussion



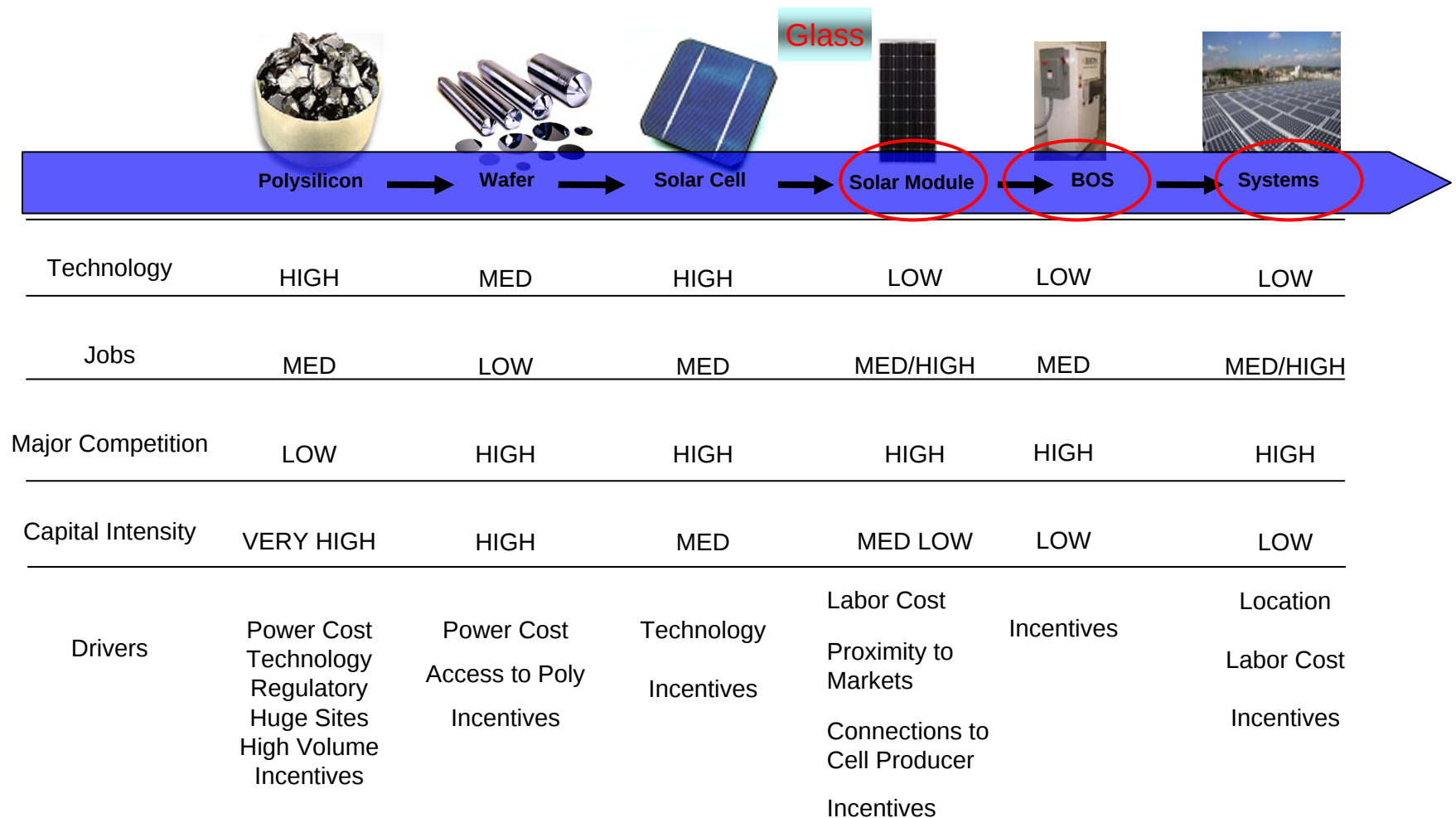
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Solar PV Manufacturing Supply Chain



- Crystalline Silicon mfg has ~90% market share
 - Higher efficiency, higher cost product (lower cost MFG investment)
- Thin Film mfg has ~10% market share, but is growing faster.
 - - Lower efficiency, lower cost product

Solar PV Manufacturing Supply Chain



Solar HW Manufacturing Supply Chain



Component MFG → **Collector MFG** → **System Packaging** → **Systems**

Technology	VARIES	LOW	VERY LOW	VERY LOW
Jobs	VARIES	MED	MED	HIGH
Competition	VARIES	HIGH	HIGH	HIGH
Capital Intensity	VARIES	LOW	LOW	LOW
Drivers	VARIES	Technology Cost Incentives	Labor Cost Proximity to Markets Incentives	Good Solar Location Labor Cost Incentives

Solar HW Manufacturing Supply Chain

■ Major System Components

- Collectors
- Tanks
- Piping
- Controls
- Pumps
- Flashing / Mounting
- Heat Transfer Fluid

■ Sub-components

- *Glass Tubes
- *Glass Sheets
- *Copper Tubes / Fins
- *Aluminum Fins
 - * Some w/ Specialty Coatings
- Stamped Steel caps, other components
- Common Plumbing Fittings
- Freeze/Expansion valves
- Other Valves
- Controllers/Actuators
- Temperature Sensors
- Pump Components
- Heat Exchangers
- Plastic Housings, Connectors