Thermodynamics and Heat Transfer
Lecture 10: Renewable Energy Systems

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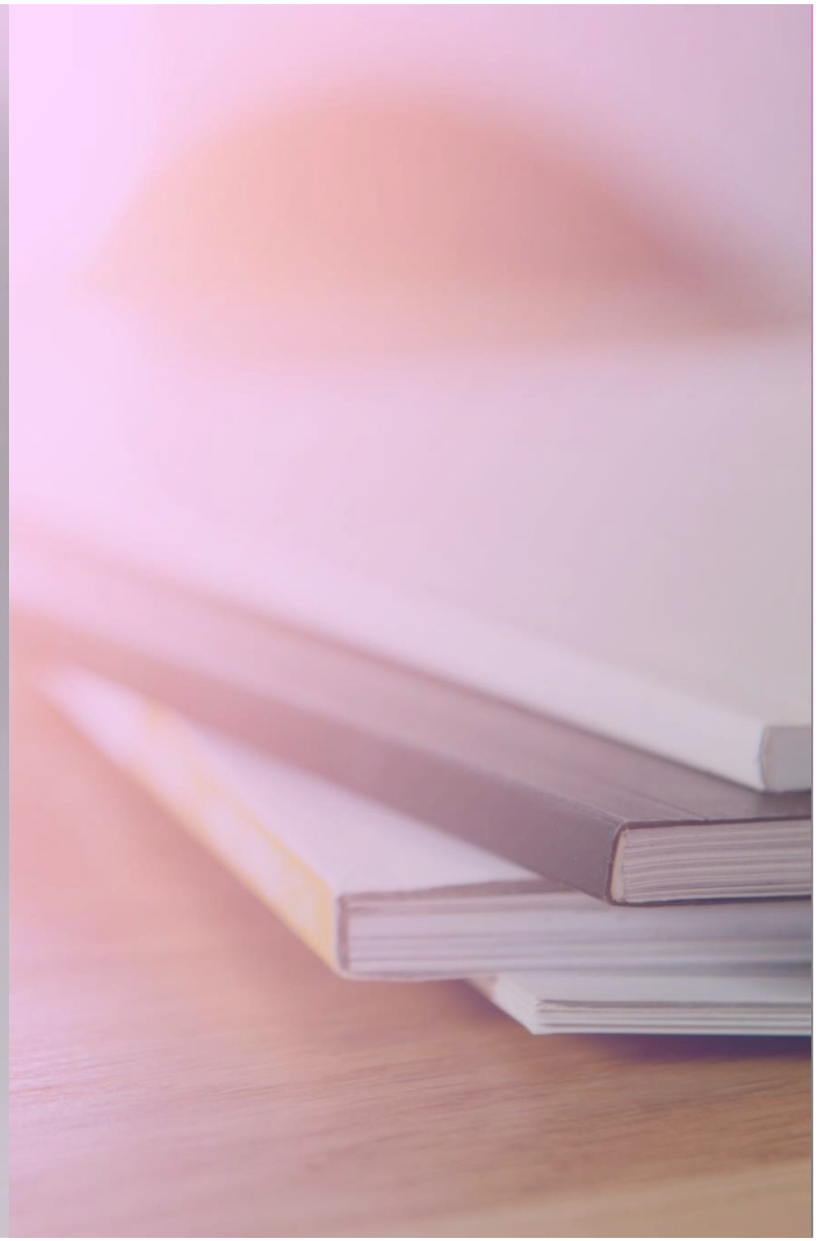
Energy Efficiency and Systems

Learning outcomes:

- What Is Solar Thermal and How Do We Access It?
- Solar Thermal Power Plants
- Potential of Solar Thermal
- Penetration and Future of Solar Thermal
- Geothermal
- Hydropower
- Bioenergy
- System Advisor Model (SAM, NREL)



What Is Solar Thermal and How Do We Access It?

Video Credit: https://youtu.be/FgjfJGfusdE

Solar Thermal Power Plants

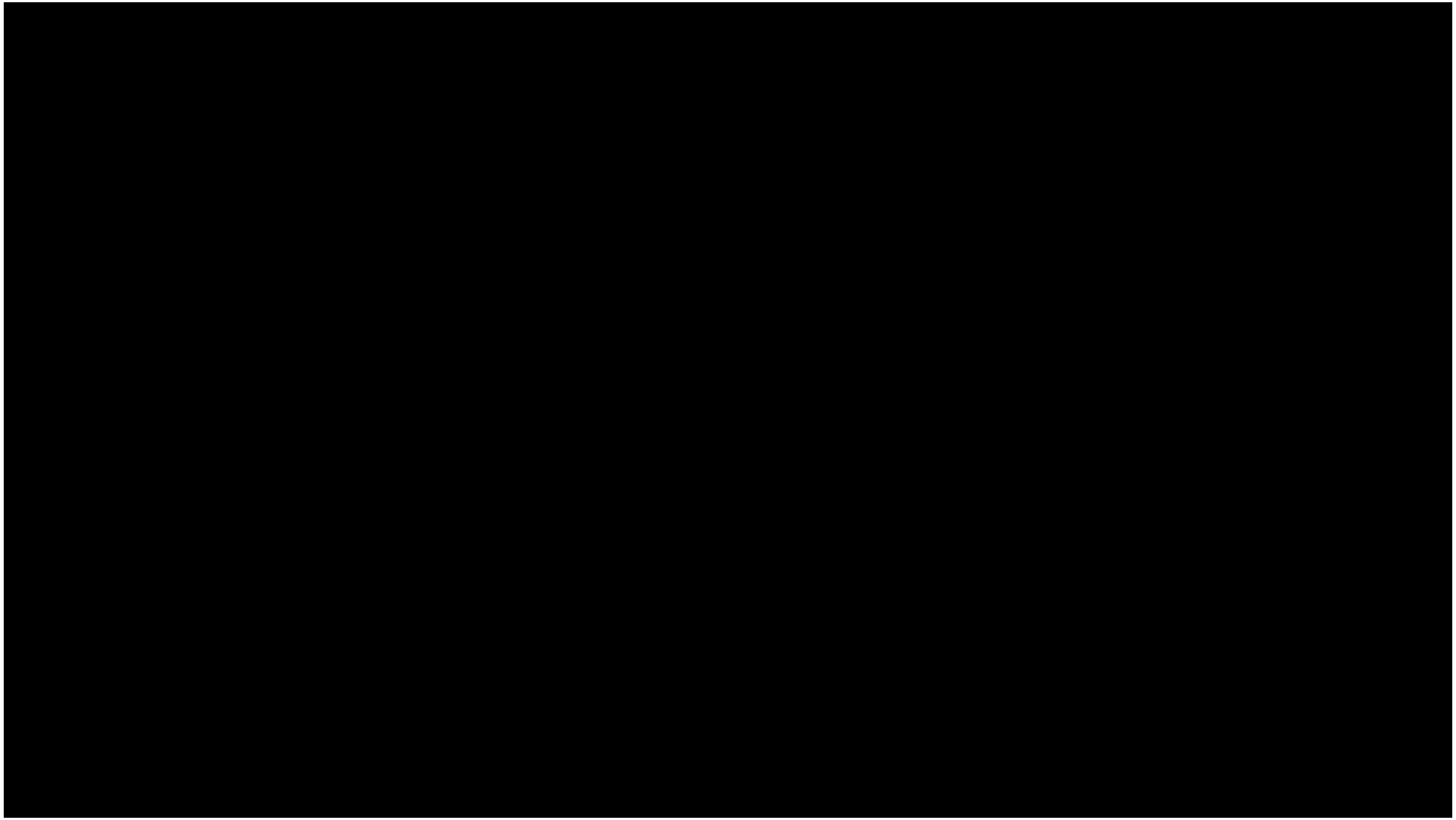
Solar Power Tower System

Solar Dish/Stirling System

Solar linear Fresnel System

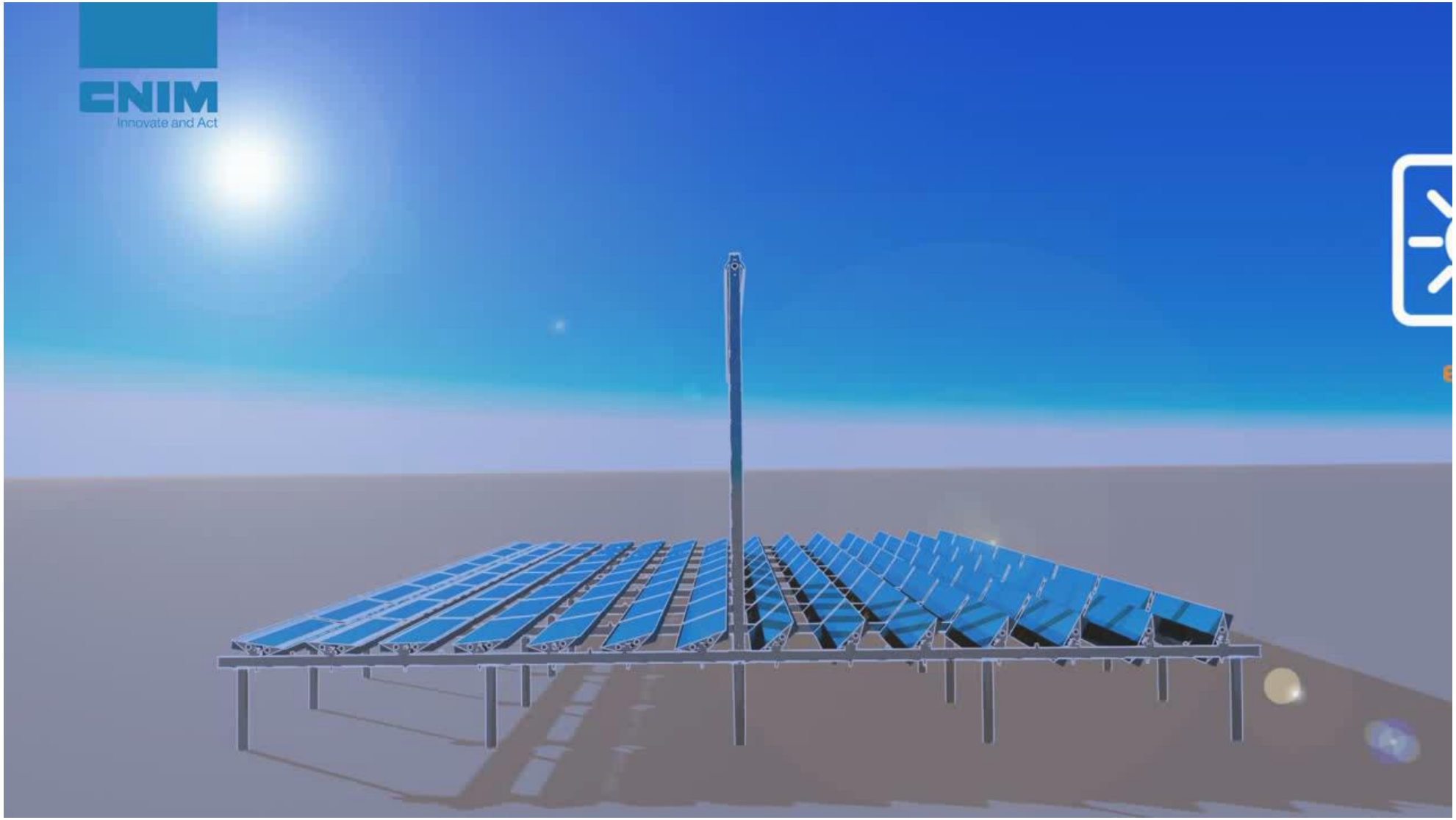
Solar Parabolic Trough System

Solar power tower system:



Video Credit: KeepItCleanCreative, https://youtu.be/QTNU1JMhzxA

Solar linear Fresnel System

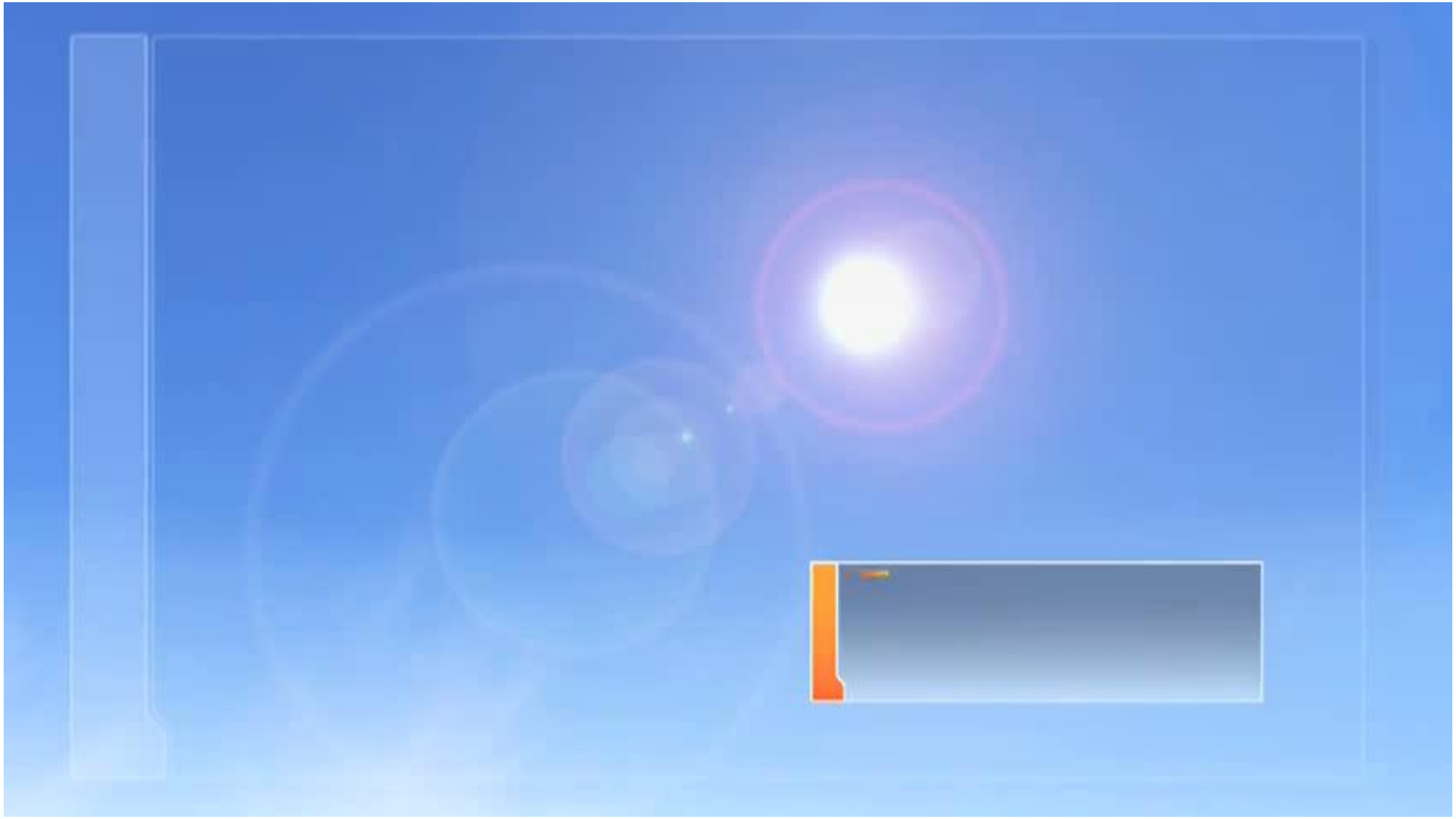


Video Credit: CNIM Group- https://youtu.be/pP48pAb8sec

Solar Parabolic Trough System

Video Credit: Konstantin Stalinsky- https://youtu.be/N1-zjbRqYXk

Solar Dish/Stirling System

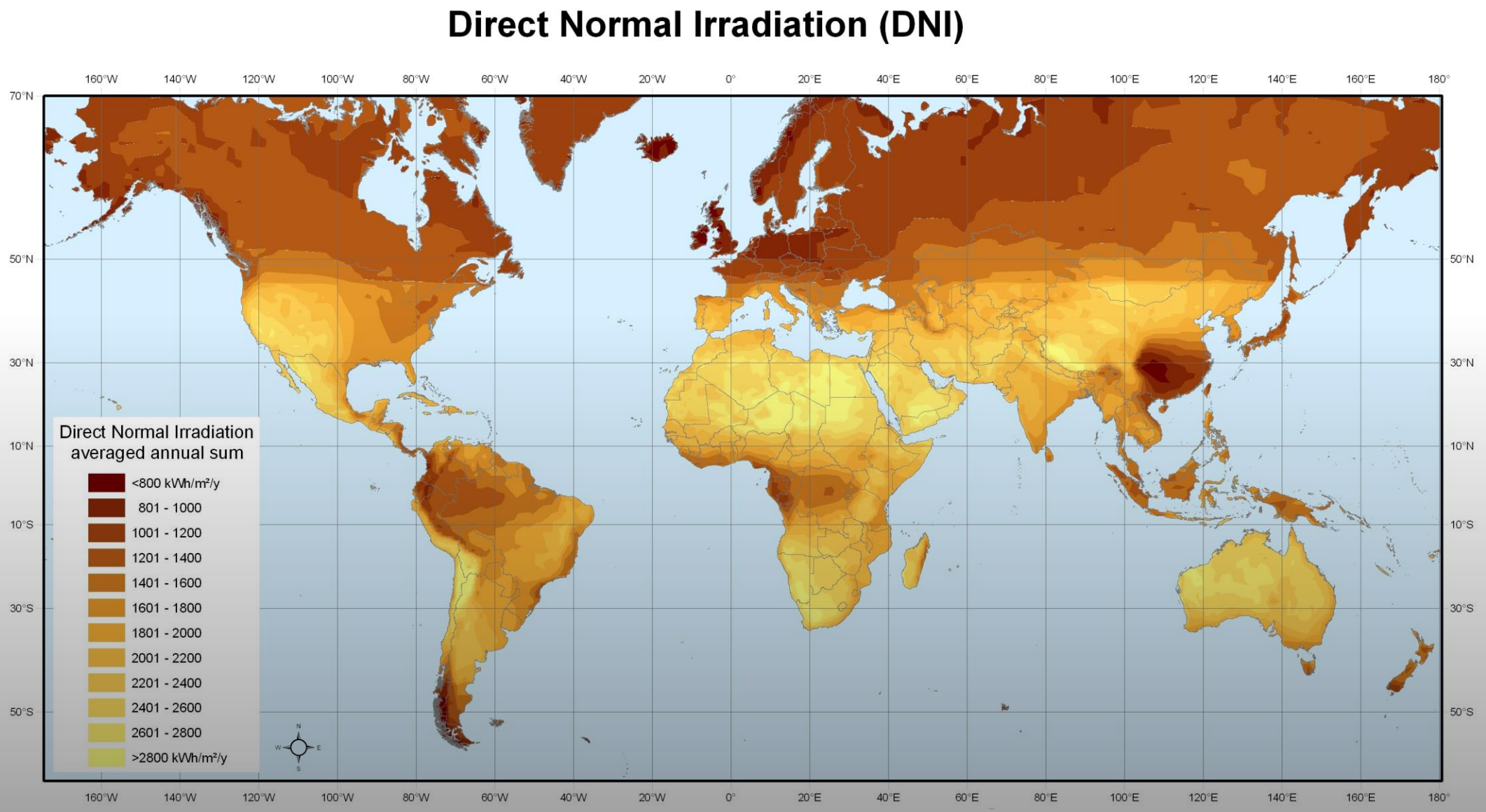


Video Credit: Atticus Digital- https://youtu.be/Ur7TaijsLxM

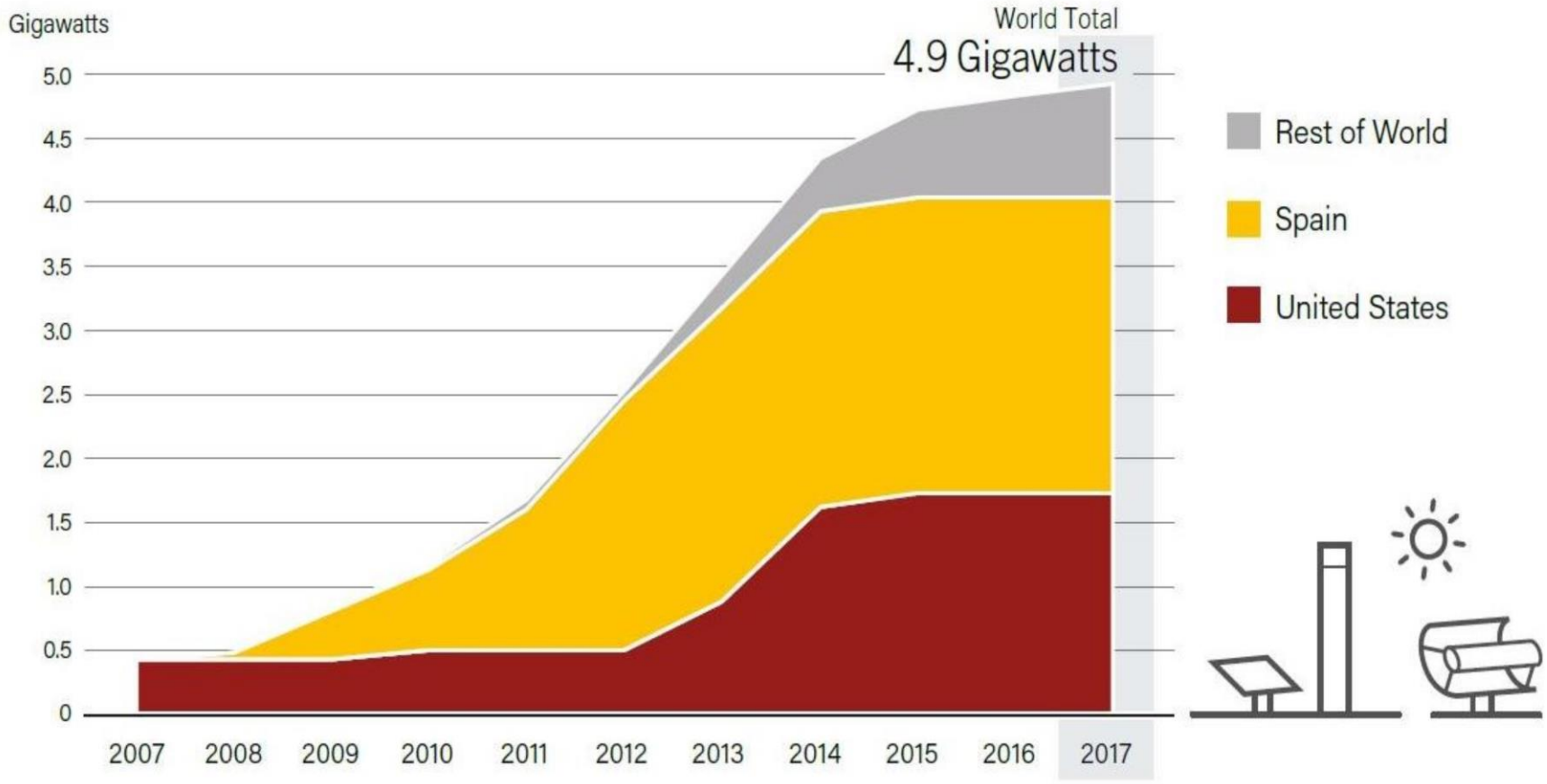
Project Visit: India

Video Credit: IGEF So- https://youtu.be/o4lKYvQTVCs

Potential of Solar Thermal



Penetration and Future of Solar Thermal



Desired characteristics of working fluids

- High specific heat capacity for energy storage
- High thermal conductivity
- High boiling point and thermal stability
- Not corrosive
- Abundant and cheap

Solid storage

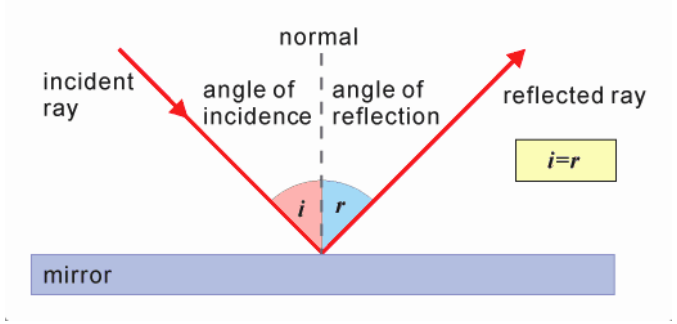
- Concrete
- Rocks
- Metals
- Ceramic

Working fluids being investigated

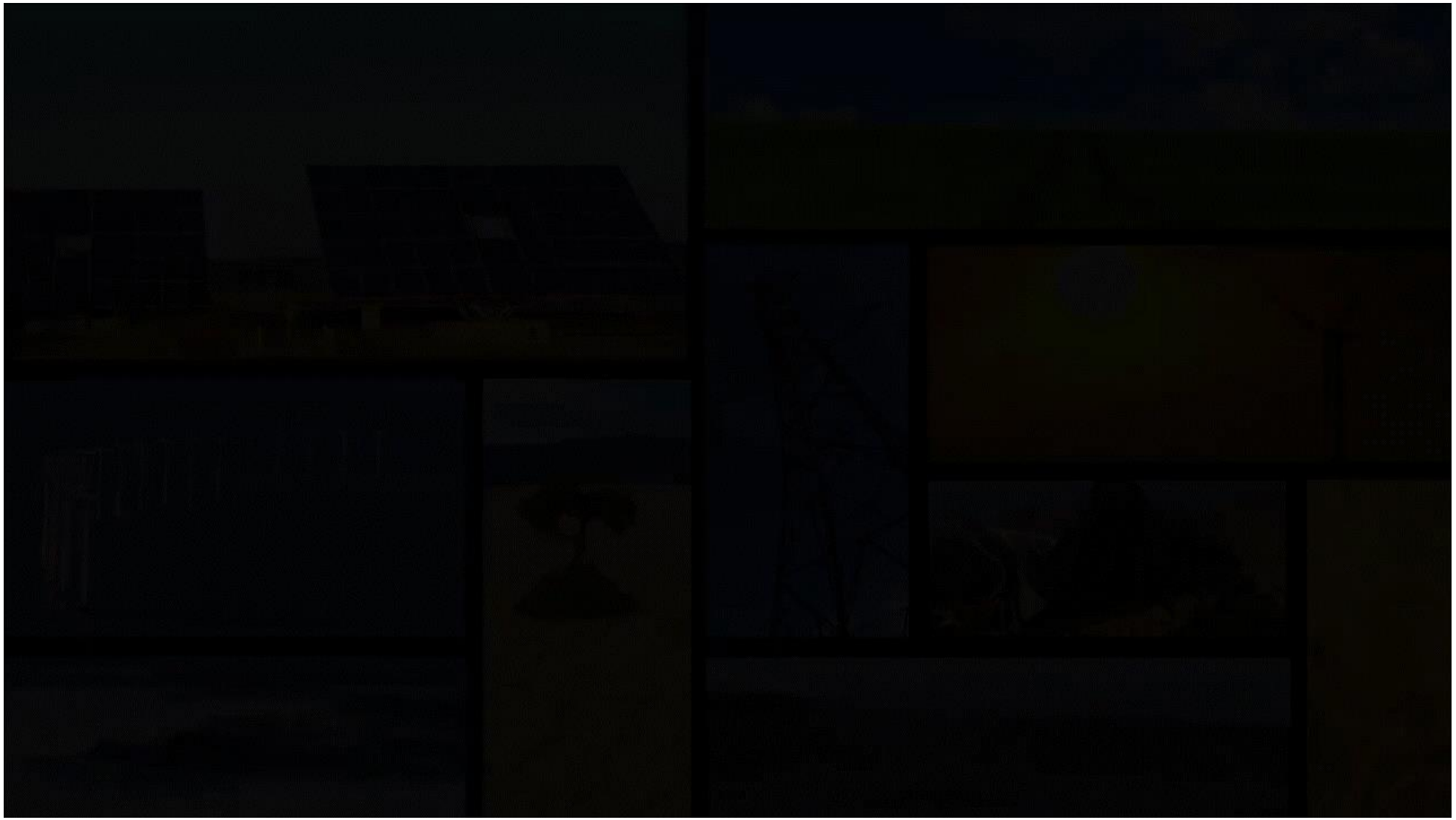
- Gases (e.g., Air and Helium)
- Liquid metals (e.g., liquid sodium)
- Supercritical fluids (supercritical CO2 for instance!)

Mirrors

- To improve the reflecting property of the mirrors

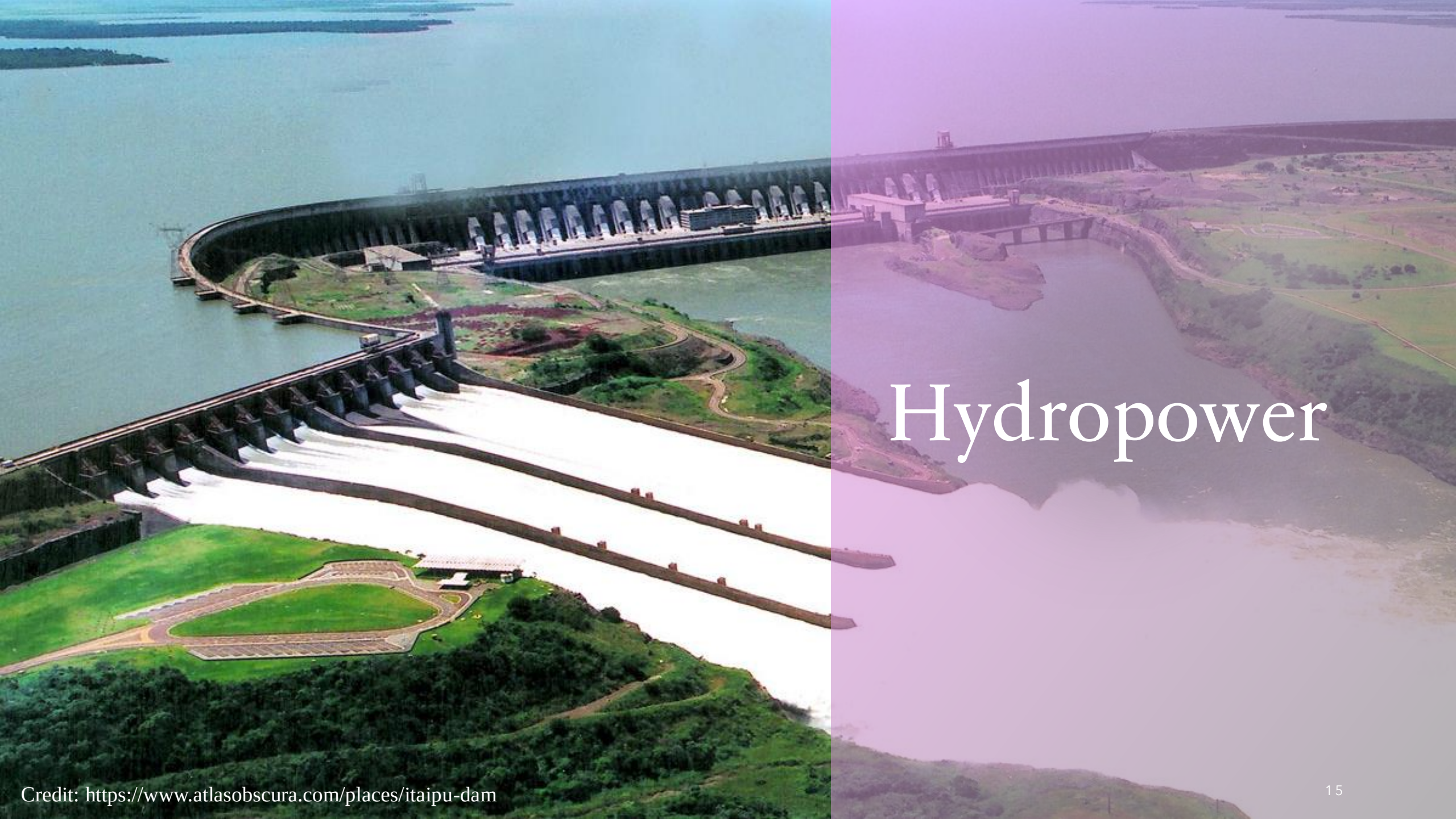


Geothermal Energy

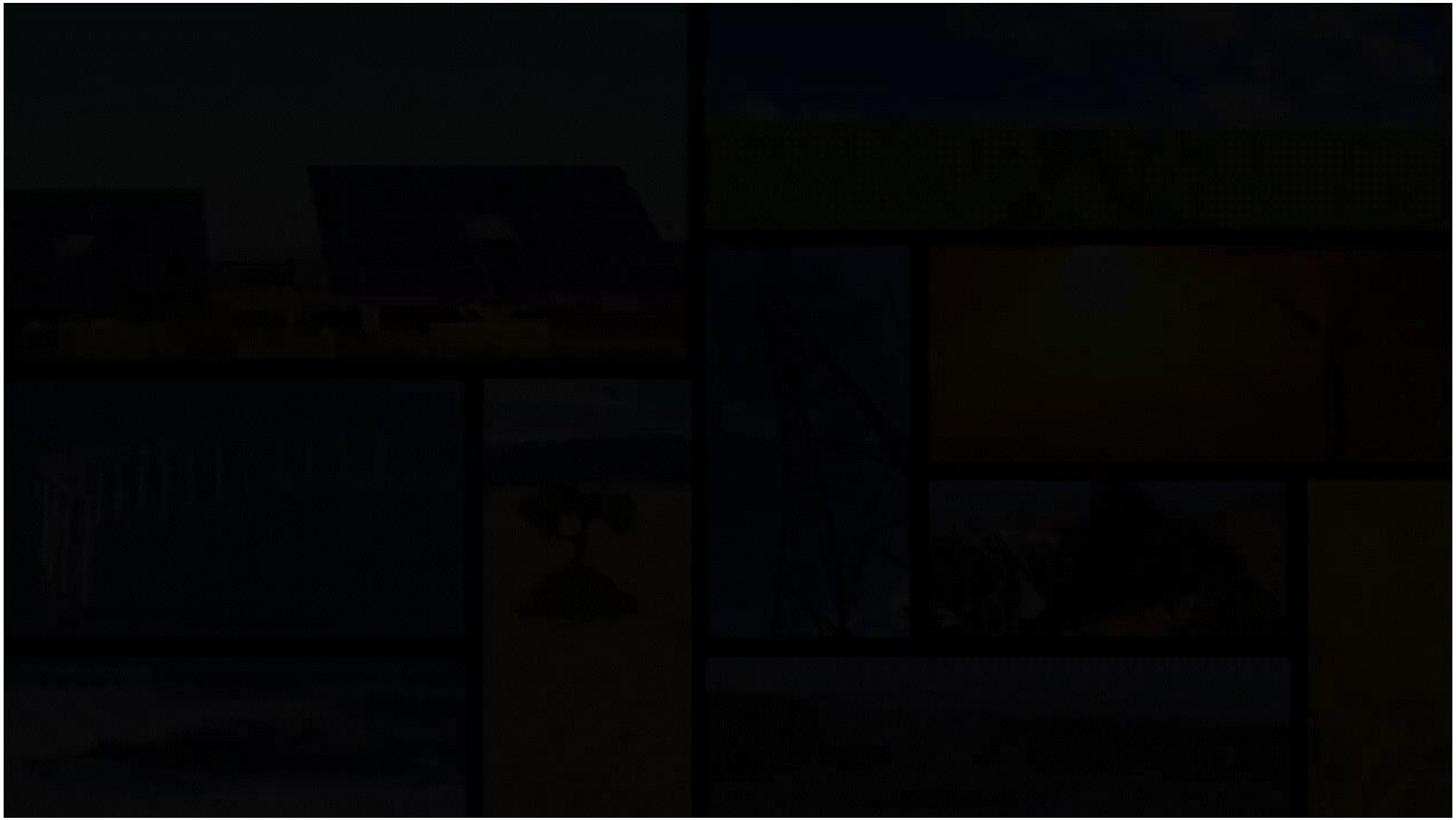


Vide Credit: The University of Queensland, Australia, Full Course at: https://www.edx.org/

Hydropower



Credit: https://www.atlasobscura.com/places/itaipu-dam



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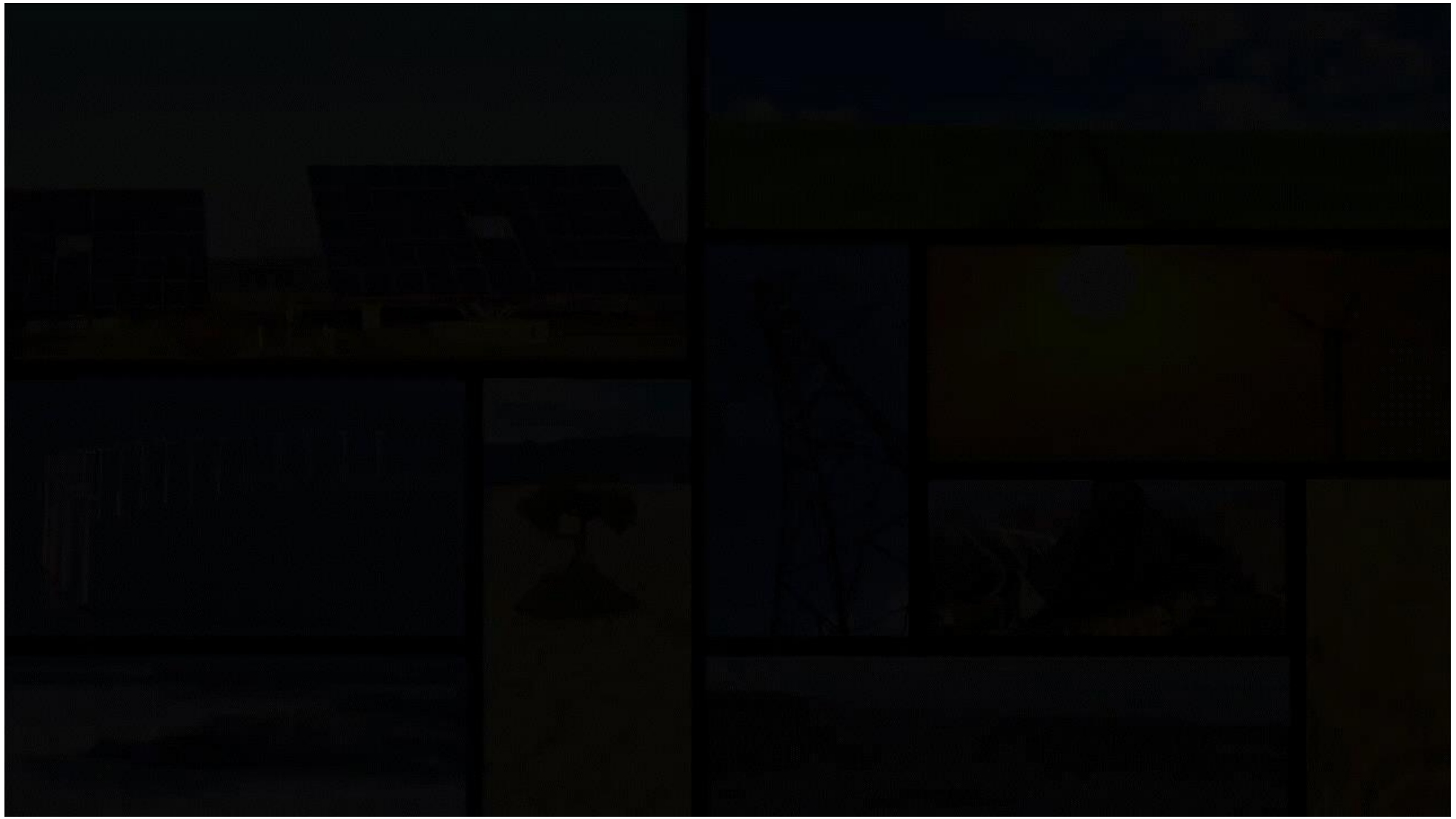
Bioenergy



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Thank you

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