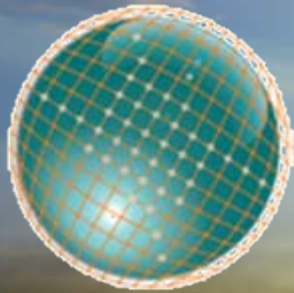


# Tutorial: Solar PV Technologies

Chad Duty, G. E. Jellison (ORNL)

John Wohlgemuth (NREL)



4<sup>th</sup> International Conference on  
**Integration of  
Renewable and Distributed  
Energy Resources**

December 6-10, 2010

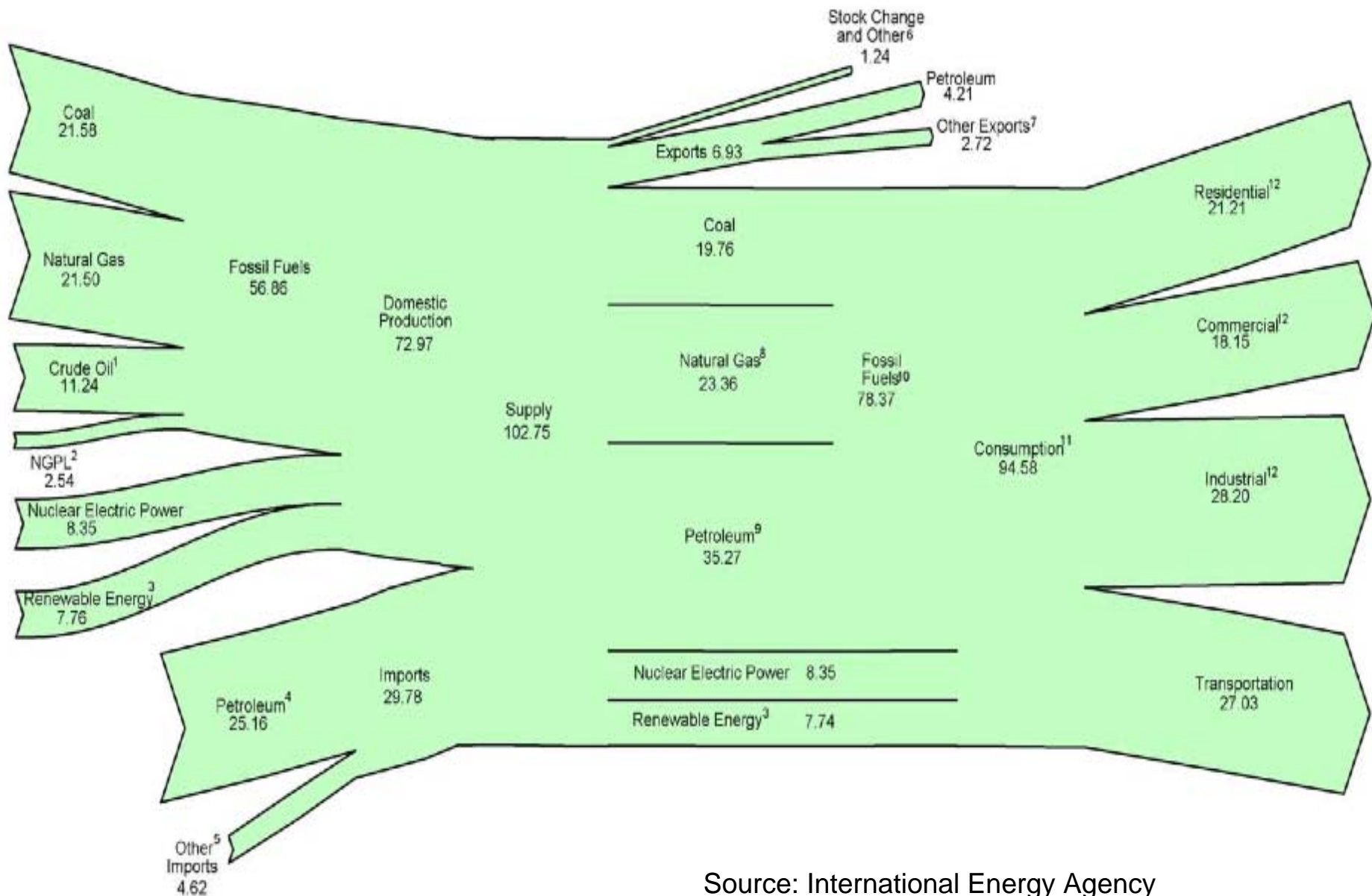
Albuquerque, USA



U.S. DEPARTMENT OF  
**ENERGY**



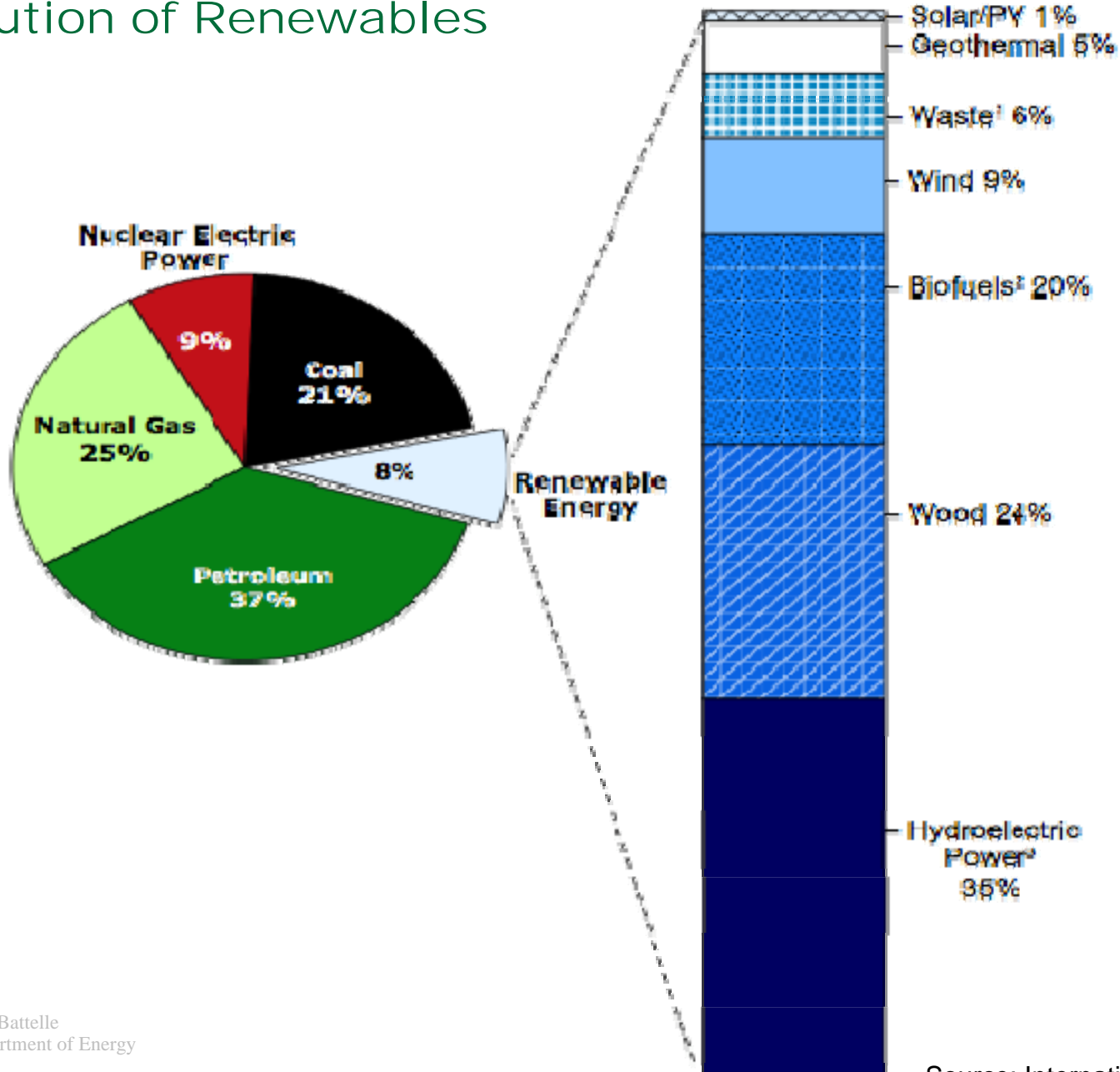
# Energy Flow in the United States



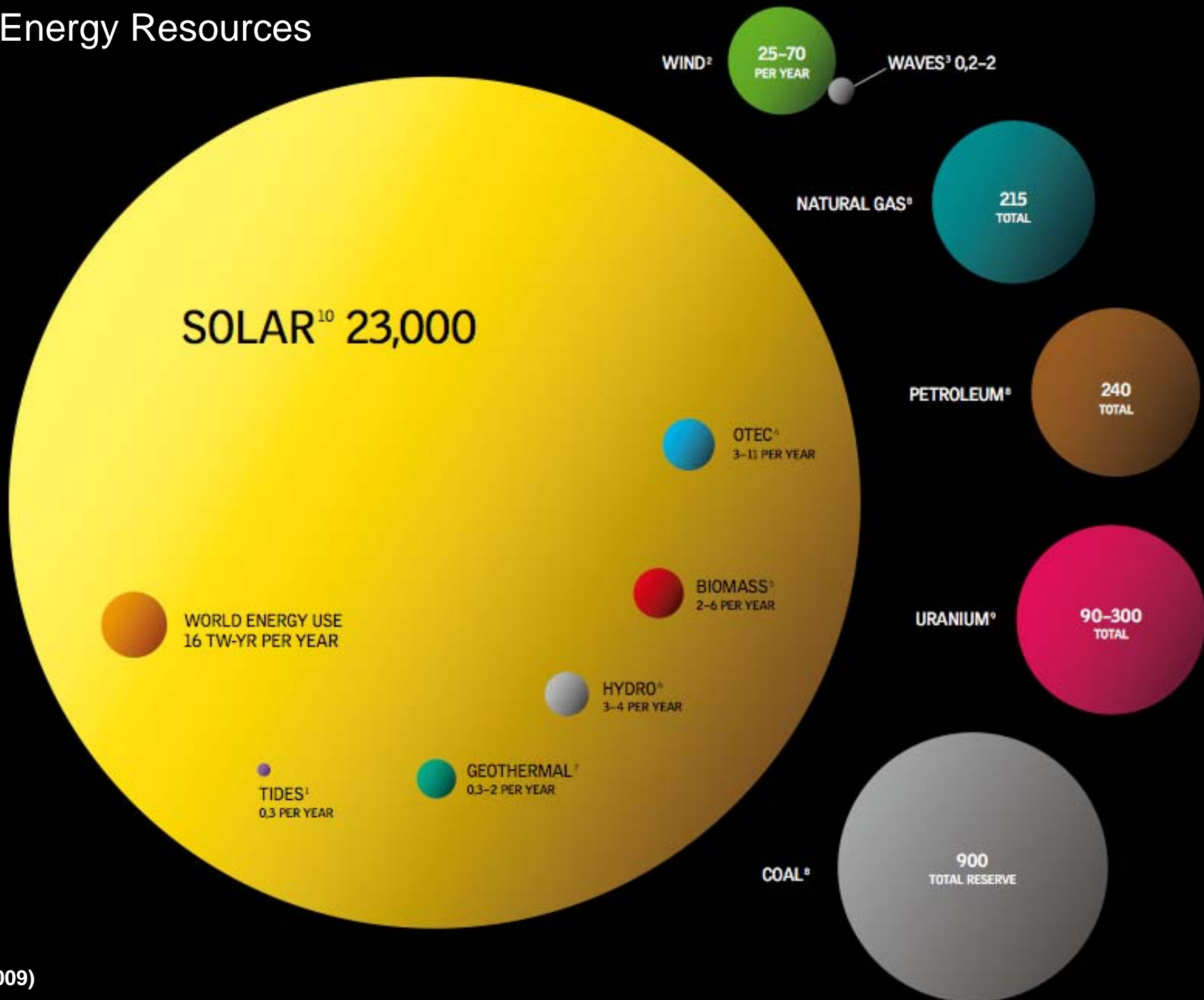
Source: International Energy Agency

# Energy Flow in the United States

## Contribution of Renewables



# World Energy Resources



# Solar Energy Technologies

## Photovoltaic



PV systems use semiconductors to convert sunlight directly to energy.

## Concentrated Solar Power



CSP systems focus the sun's heat onto a generator to produce electricity.

## Solar Heating



Solar collectors absorb the sun's energy to provide low temperature space or water heating.

## Solar Lighting



Passage for natural interior lighting or piping light indoors using fiber optics.

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### Energy Conversion

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Light → Electricity

Heat → Electricity

Heat → Heat

Light → Light

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### Conversion Type

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Direct

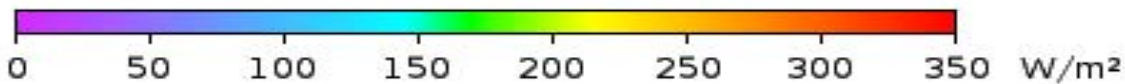
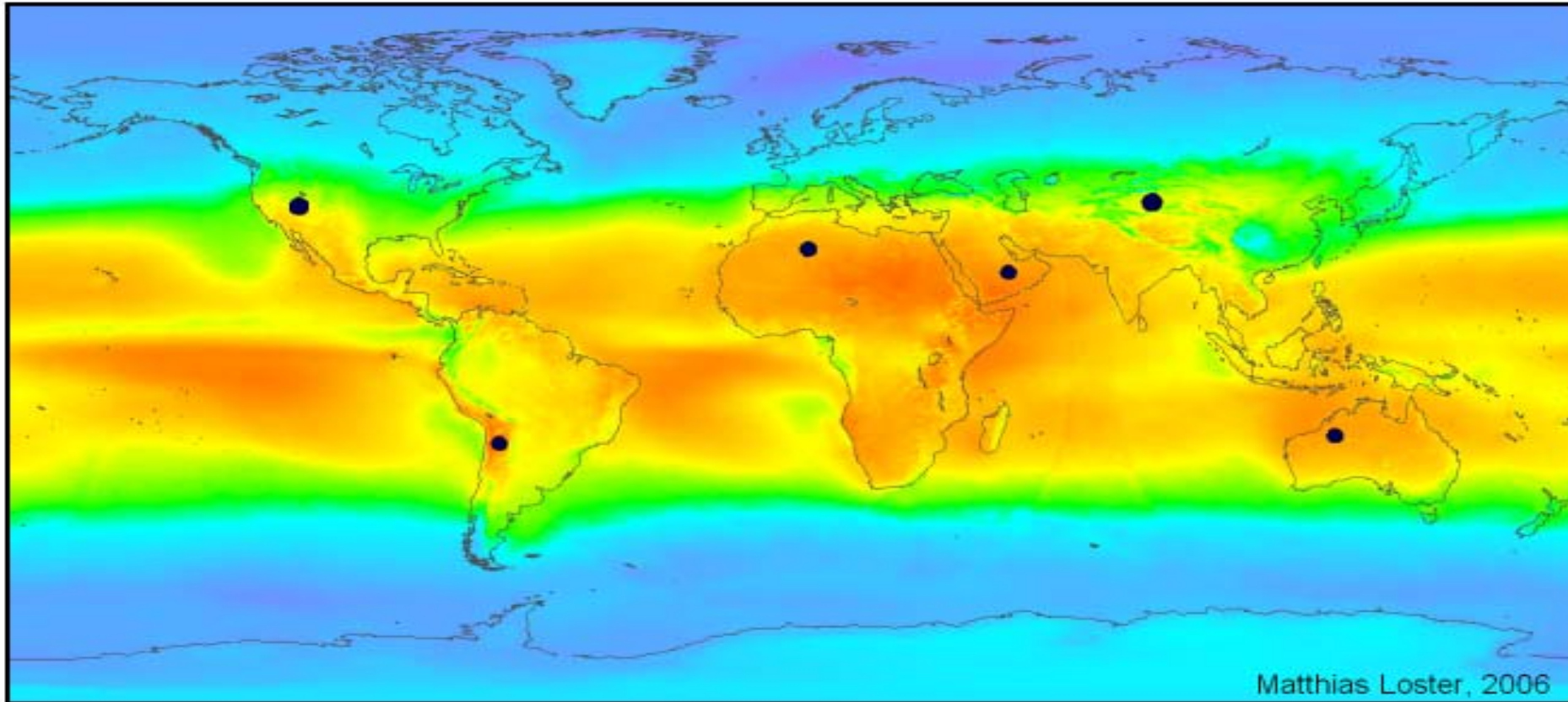
Indirect

Direct

None

# Enough Energy to Go Around...

Average Insolation (radiation energy / area)



$\Sigma \bullet = 18 \text{ TWe}$