

# **Mission to Develop Affordable Solar Energy:**

## **A Signature Canada India Collaboration Project**

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# Mission to Develop Affordable Solar Energy:

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- Global Context
- Project Vision and Rationale
- Strategy and Plan

# World at Night



# What does it mean?



**Energy's link to human development:**



**Productivity**

**National Income**

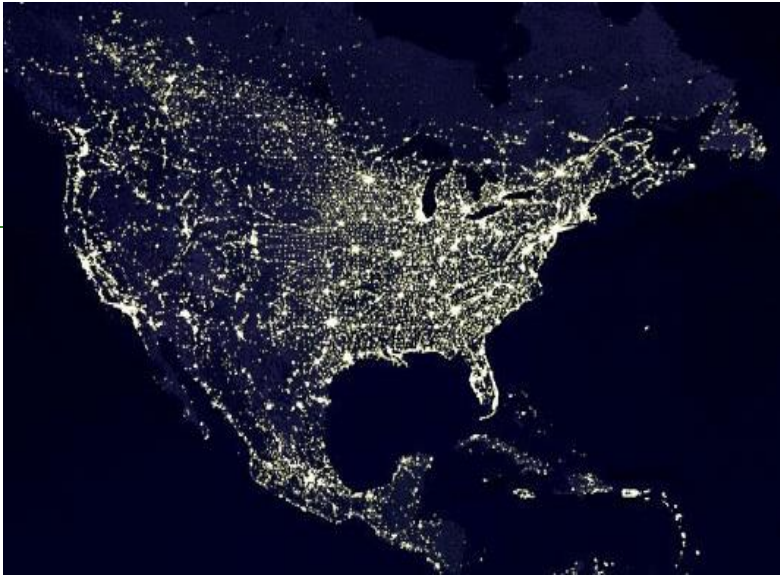
**Health**

**Education**

**Social Development**



# What does it mean?



# Electricity, Life Quality, Human Development

**GLOBAL COLLABORATION**

Life Expectancy: 80 yrs

**IMPROVED LIFE QUALITY**

Life Expectancy: 60 yrs

**BASIC QUALITY OF LIFE**

Life Expectancy: 60 yrs

**SURVIVAL**

Life Expectancy: 40 yrs

$10^4$

$10^3$

$10^2$

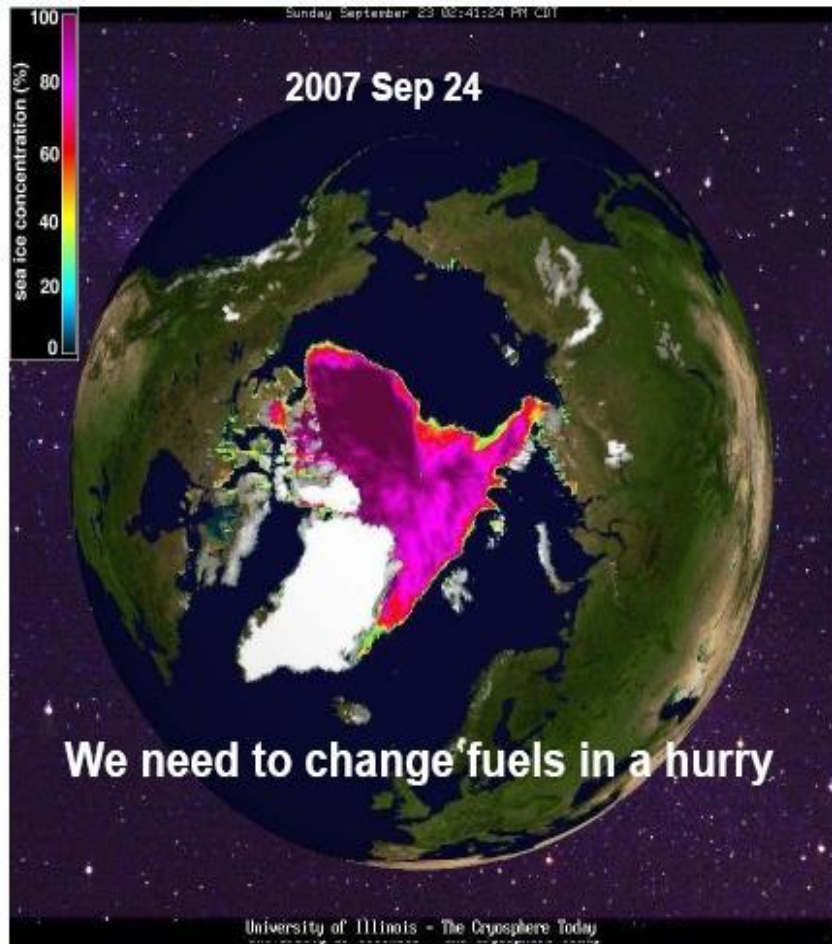
Annual  
\$GDP/Capita

Annual  
kWh/capita





# The global challenge: how to de-carbonize



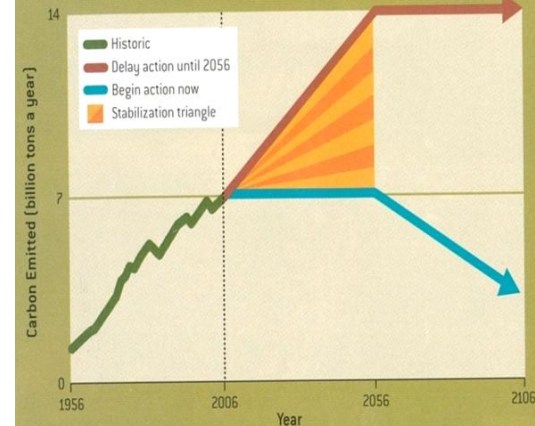
## MANAGING THE CLIMATE PROBLEM

At the present rate of growth, emissions of carbon dioxide will double by 2056 (*below left*). Even if the world then takes action to level them off, the atmospheric concentration of the gas will be headed above 560 parts per million, double the preindustrial value

(*below right*)—a level widely regarded as capable of triggering severe climate changes. But if the world flattens out emissions beginning now and later ramps them down, it should be able to keep concentration substantially below 560 ppm.

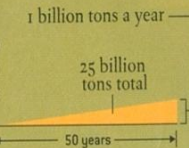
### ANNUAL EMISSIONS

In between the two emissions paths is the "stabilization triangle." It represents the total emissions cut that climate-friendly technologies must achieve in the coming 50 years.



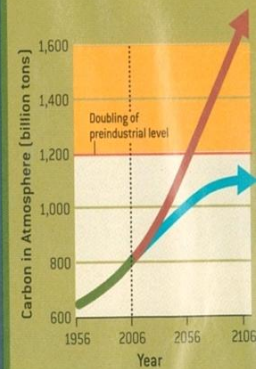
### THE WEDGE CONCEPT

The stabilization triangle can be divided into seven "wedges," each a reduction of 25 billion tons of carbon emissions over 50 years. The wedge has proved to be a useful unit because its size and time frame match what specific technologies can achieve. Many combinations of technologies can fill the seven wedges.



### CUMULATIVE AMOUNT

Each part per million of CO<sub>2</sub> corresponds to a total of 2.1 billion tons of atmospheric carbon. Therefore, the 560-ppm level would mean about 1,200 billion tons, up from the current 800 billion tons. The difference of 400 billion tons actually allows for roughly 800 billion tons of emissions, because half the CO<sub>2</sub> emitted into the atmosphere enters the planet's oceans and forests. The two concentration trajectories shown here match the two emissions paths at the left.



# Project Vision and Concept

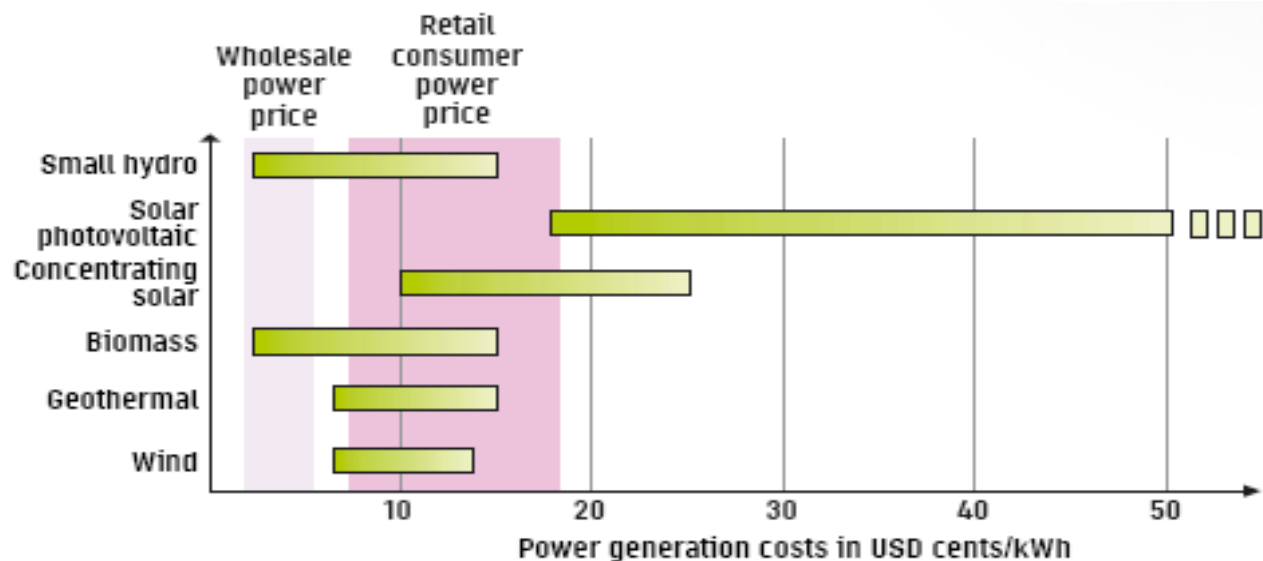
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- ❑ **Low-cost renewable energy critical**
- ❑ **Solar energy is part of the answer.**
- ❑ **New technologies will make solar energy more affordable.**
- ❑ **Project aims to bring nano-based technologies out of the lab, to make a difference in the world.**



# Project mission is a formidable challenge

- Below grid parity to affordable solar for the masses
- Nano-based > 50% efficiency
- Obviate expensive grid infrastructure

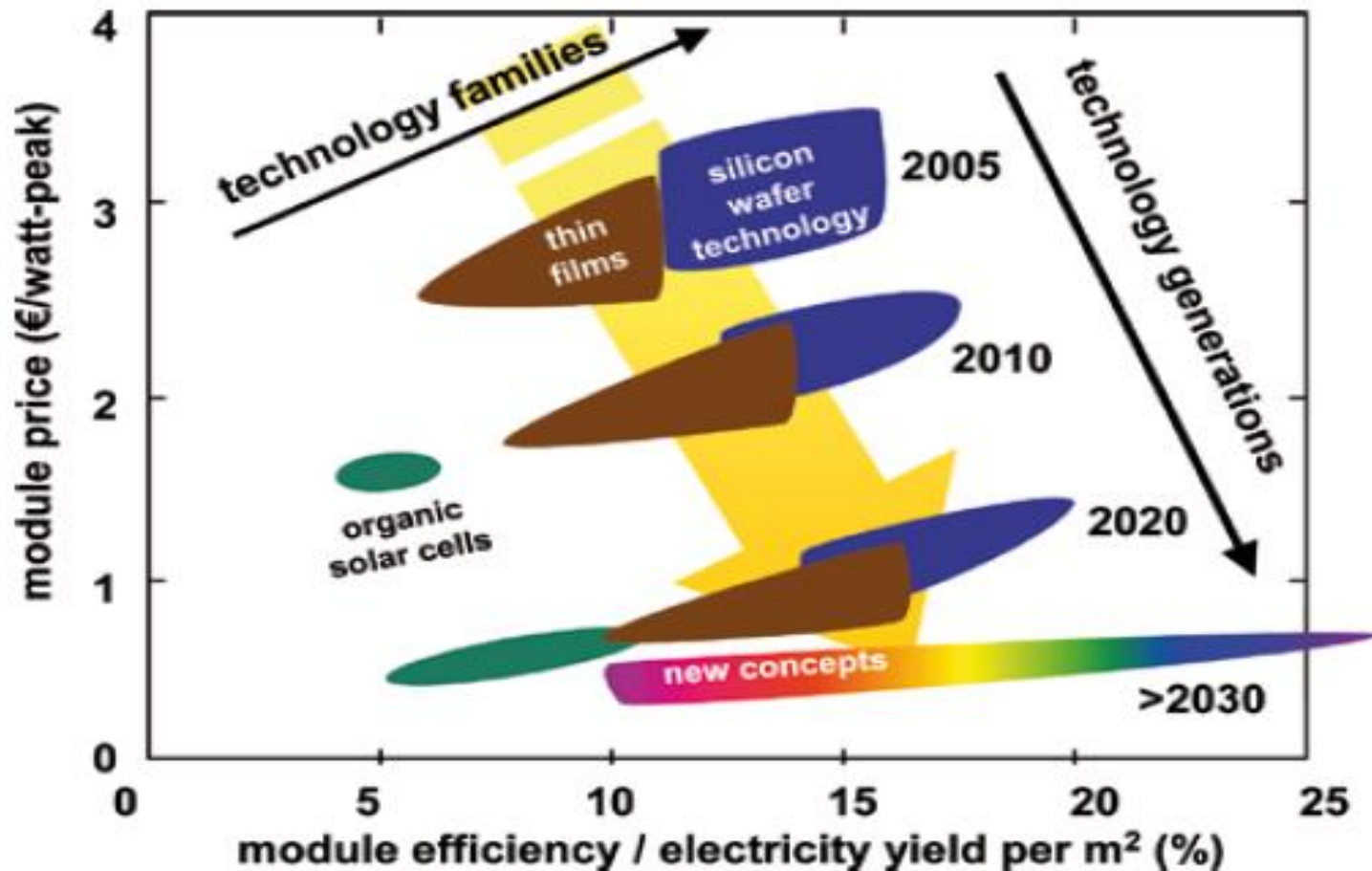


# Strategy and Plan

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- **Phase 1: Fundamental research to establish "Proof of Principle"**
- **Phase 2: Prototyping and Scaling up**
- **Phase 3: Manufacturing and Commercialization**

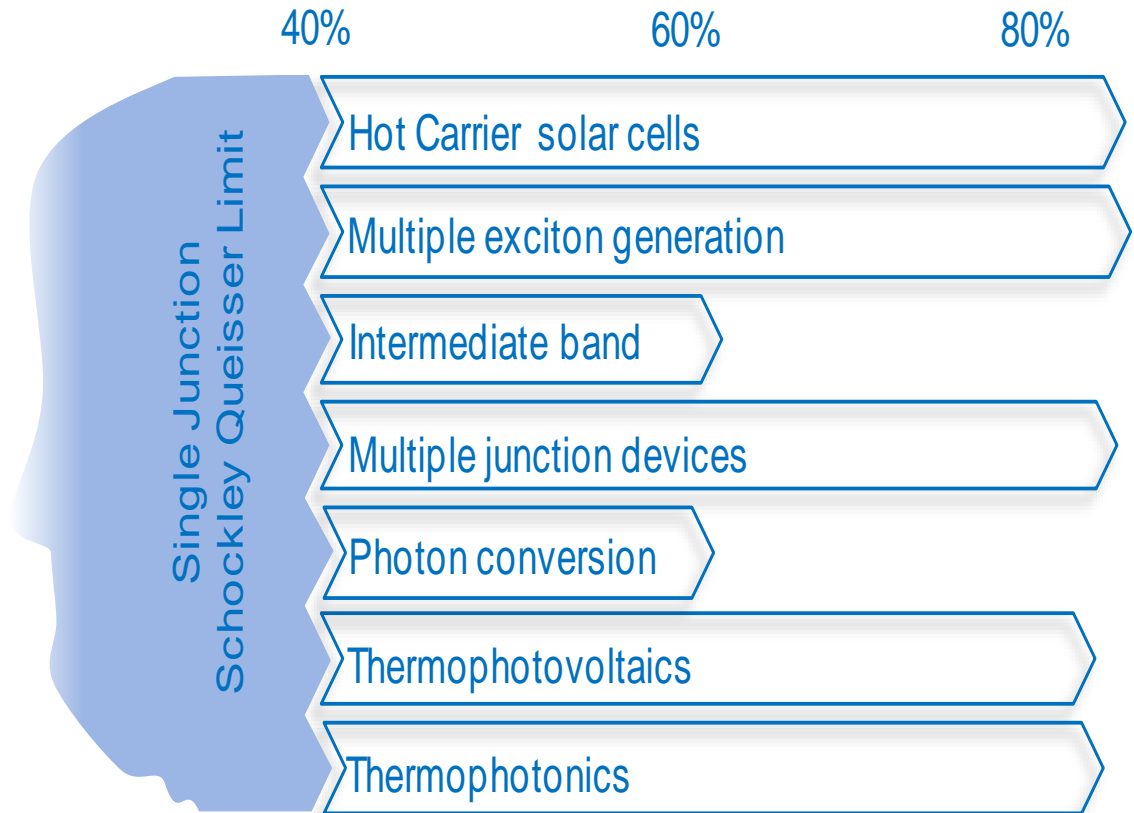
# Newer technology generations lead to rapid cost reduction



(source: Schott Solar)

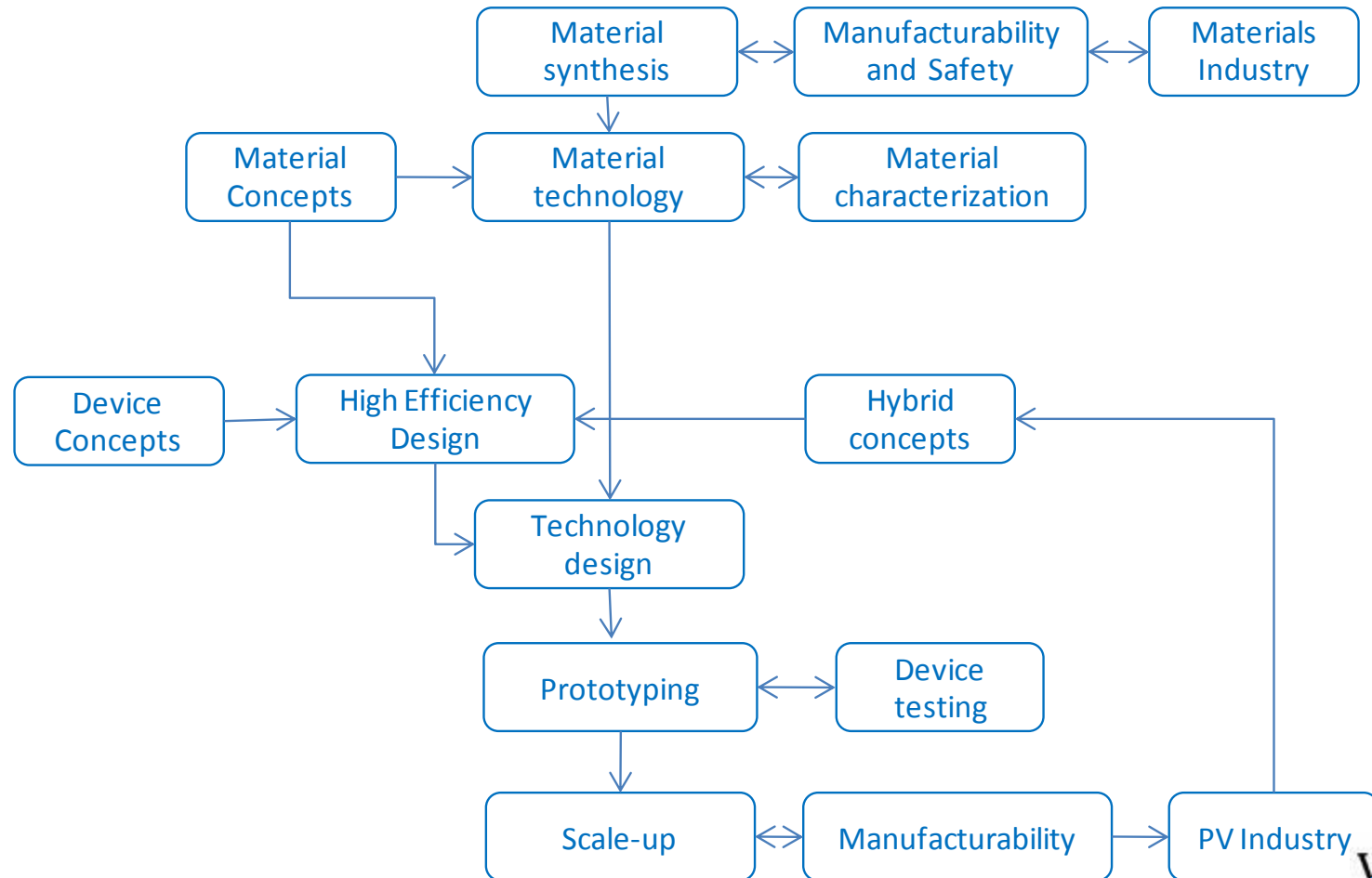
# Future Pathways for Very High Efficiency PV Devices

- Theoretical predictions of device performance remain scientifically unchallenged
- Breakthrough research in materials and device technology is necessary for practical realization of high performance PV devices





# R&D Concept and Plan



# Partnership structure under development

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- Academic
- Industry
- Government

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