



Development Solutions from Asia & the energy archetype

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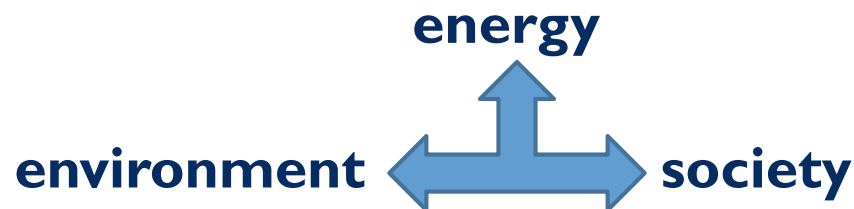
outline of the energy archetype

- ▶ the global energy outlook & something to think about
- ▶ energizing development with newbies
- ▶ let's think about eclectic systems instead: energy and society, gender and energy
- ▶ small is beautiful: autarchic off-grid power solutions
- ▶ the future must be shaped the right way:
biomimicry or inspired by nature

global energy outlook

energy for society

the quality of energy services are in direct proportion to individual quality of life, well being of society and conservation of the environment



Asian energy outlook: demand and supply in a business-as-usual scenario 2010- 2035

introduction: in the Asia Pacific context the most common factors that contribute to regional energy poverty are:

the high cost of providing conventional power infrastructure to reach large numbers of end-users;

heavy dependence on traditional fuels for domestic use

at national level an undesirable dependence on imported fossil fuels.

Asian energy outlook: demand and supply in a business-as-usual scenario 2010- 2035

an energy hungry continent

Asia and the Pacific's primary energy demand is projected to increase at **2.1%** per year over the outlook period (2010–2035)—faster than the projected world average growth rate of **1.5%** per year during the same period.

Asian energy outlook: demand and supply in a business-as-usual scenario 2010- 2035

an energy hungry continent

primary energy demand of Asia and the Pacific will reach 8,358 million tons of oil equivalent (Mtoe) by 2035, up from 4,9852 Mtoe in 2010.

fossil fuels will (still) dominate the primary energy mix in Asia and the Pacific through 2035, increasing their share from 82.4% in 2010 to 83.2% by 2035.

Asian energy outlook: demand and supply in a business-as-usual scenario 2010- 2035

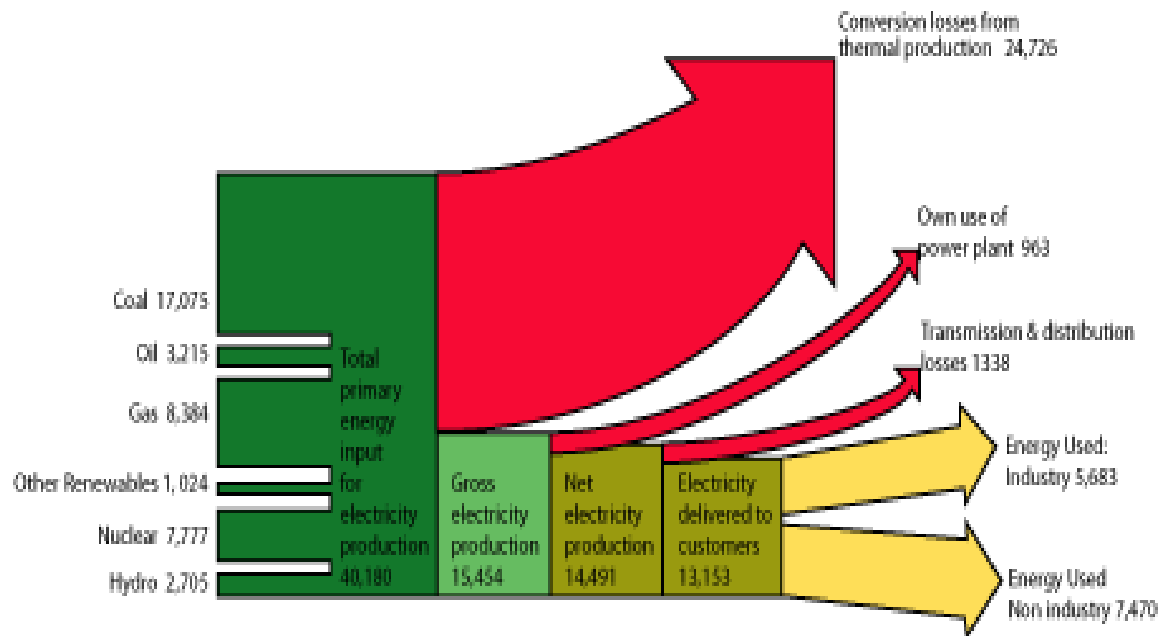
an energy hungry continent

driven by economic and industrial development and higher living standards, electricity demand in Asia and the Pacific is projected to more than **double** between 2010 and 2035, reaching 16,170 terawatt-hours (TWh) in 2035.

accordingly, electricity generation is projected to increase from 8,407 in 2010 to 18,532 TWh in 2035, at an average annual growth rate of 3.2%.

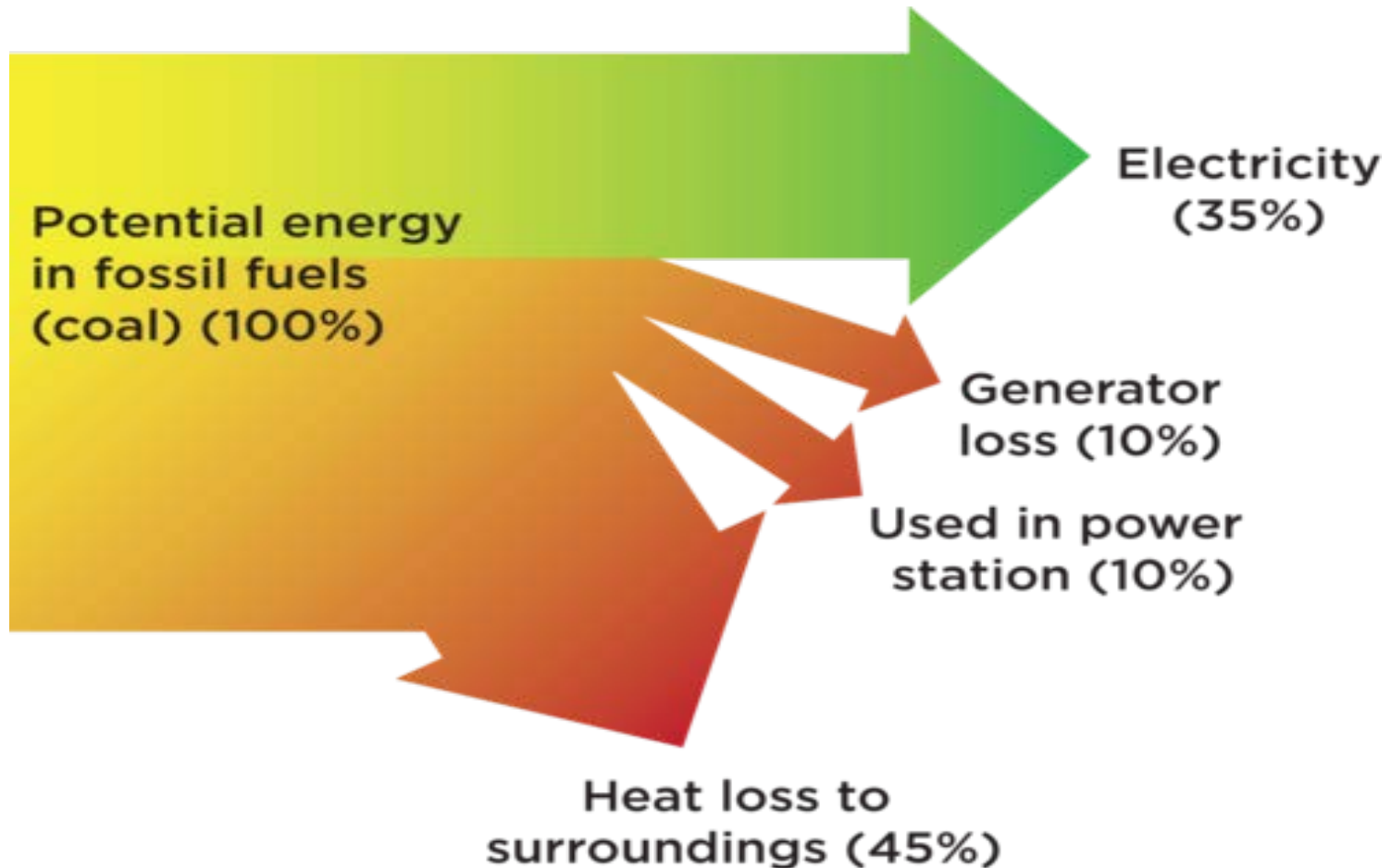
Asian energy outlook: demand and supply in a business-as-usual scenario 2010- 2035

According to the World Alliance for Decentralized Energy (WADE), “Centralized power plants waste huge amounts of energy because their heat output cannot be used locally.”

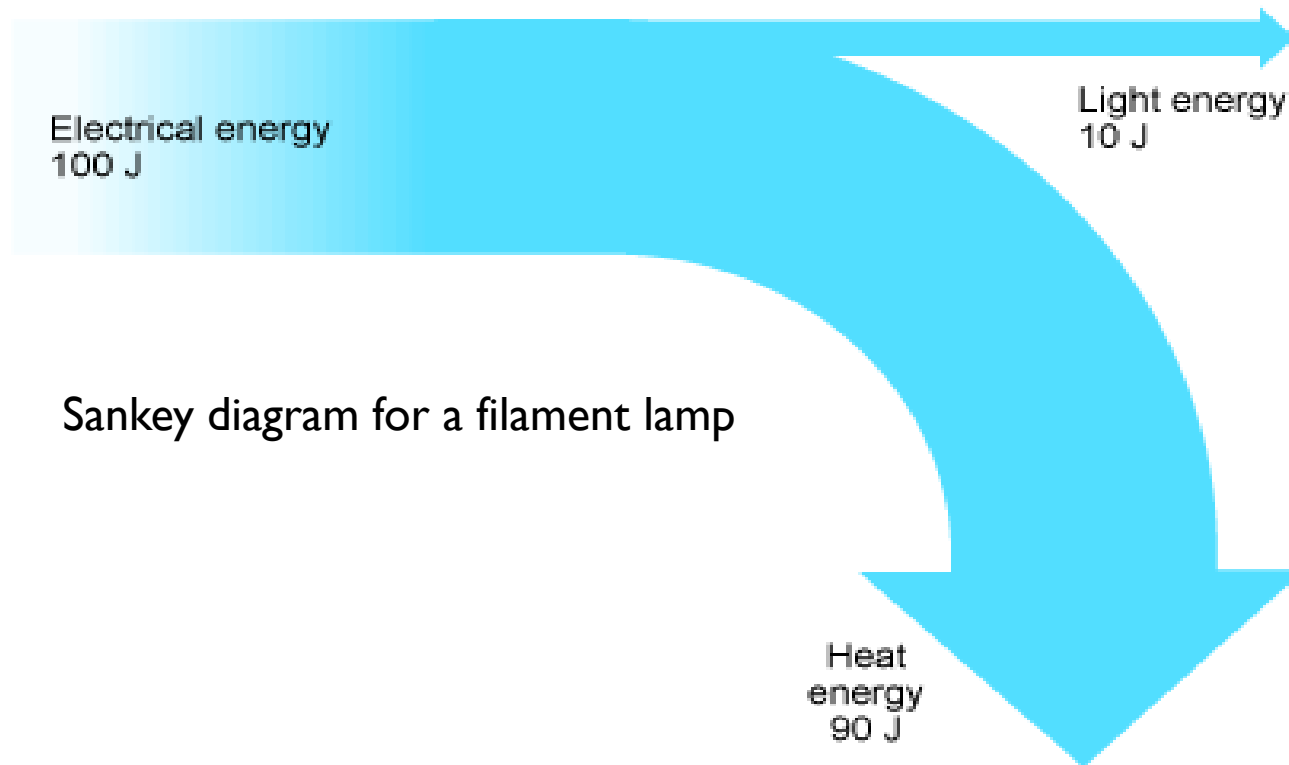


100% - [62% loss] 38%- [64% loss] 36%- [68% loss] 32%

Asian energy outlook: demand and supply in a business-as-usual scenario 2010- 2035

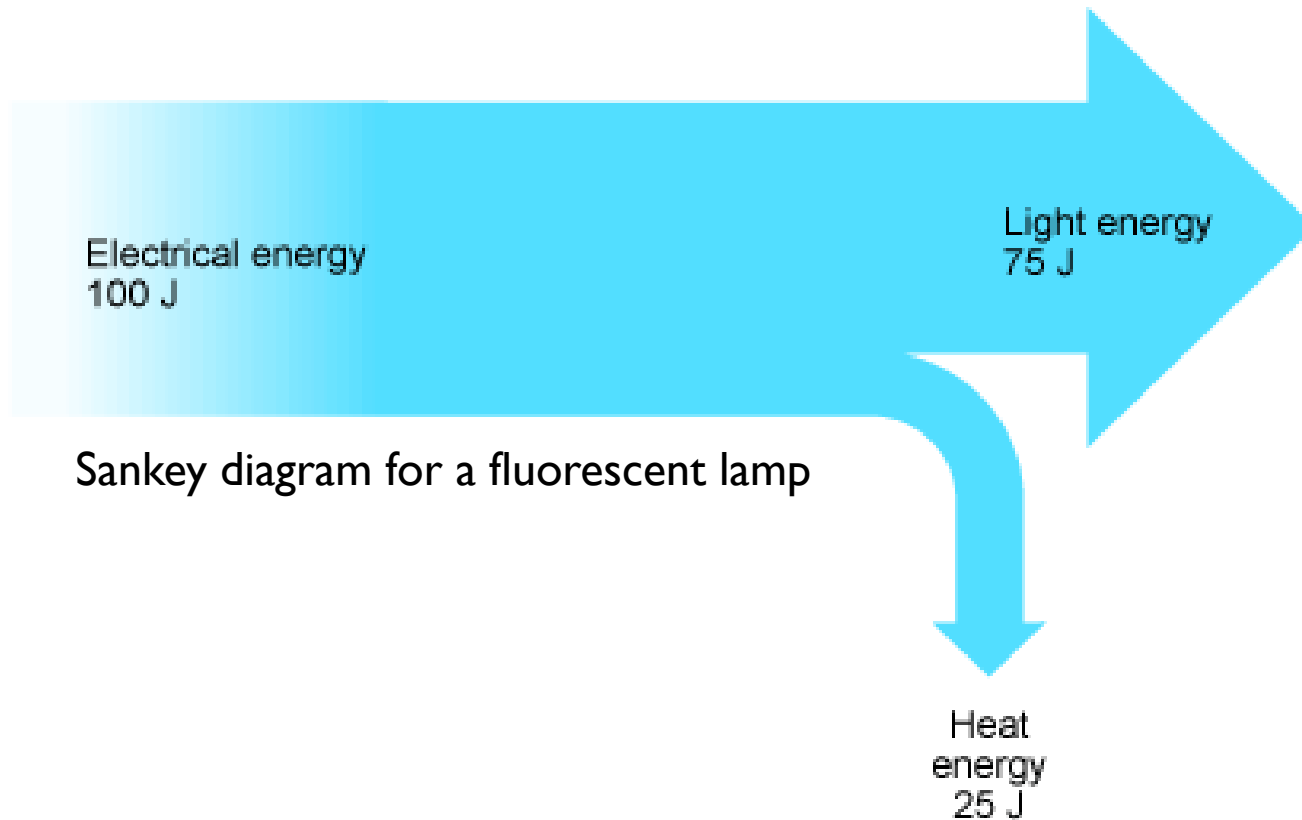


something to think about: what happens after the 32% or 35% left is this



Sankey diagram for a filament lamp

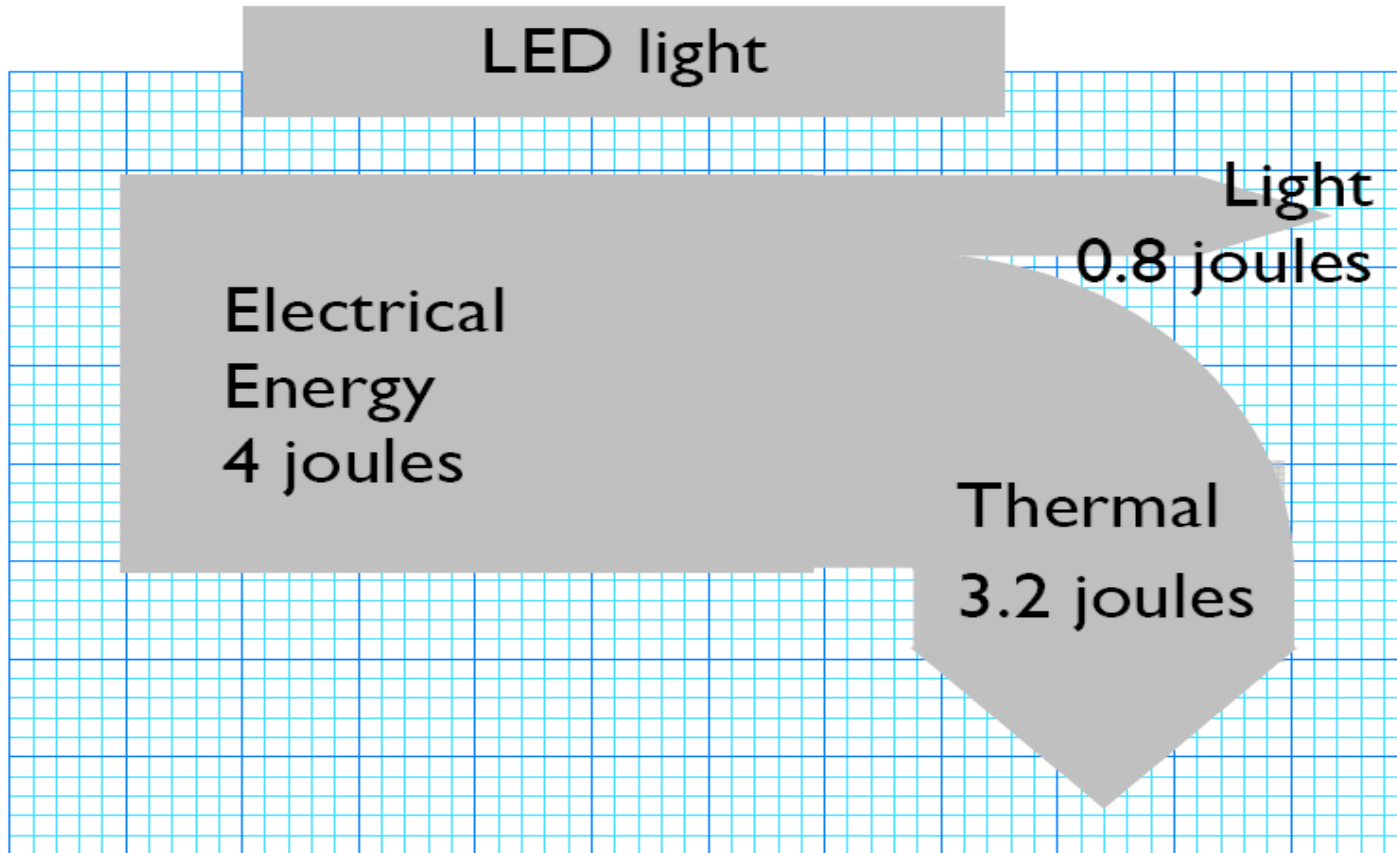
something to think about: what happens after the 32% or 35% left is this



Sankey diagram for a fluorescent lamp

something to think about: what happens after the 32% or 35% left is this

Sankey diagram for an LED lamp



energizing development with newbies

according to the **REN21 Renewables 2015 Global Status Report**

RE represented approximately 59% of net additions to global power capacity in 2015

by end of 2015 renewables comprised 27% of the world's power generating capacity, enough to supply about 23% of global electricity.

variable renewables are re-shaping the business models and how grid infrastructure it being designed.

energizing development with newbies

early in the diffusion of renewable technologies, overcoming the economic barrier is often given higher priority. With the market growing, the cost of renewable technologies will come down as a result of the experience curve effects and economies of scale. Supporting policies need to evolve accordingly as the effects of noneconomic barriers emerge

solar power installed capacity could be enhanced significantly from a mere 5.6 GW in 2010 to 338.2 GW in 2035

energizing development with newbies

solar energy is a clean, virtually inexhaustible source. large parts of Asia and the Pacific are on prime equatorial and tropical land, with one of the world's highest solar insolation levels and huge power generation potential.

given the high economic growth rates and continuing population growth, the present and projected energy supply and demand gap in Asia is a huge opportunity scaling up solar power.

energizing development with newbies

there is a common need to complement the energy mix with other clean energy sources to address seasonal variations, reduce load shedding, fossil fuel consumption, and abate greenhouse gas emissions.

solar technology is being massively scaled up across Asia as off grid and grid connected having in many cases reached already grid parity and even below (i.e. MENA region).

energizing development with newbies

an energy hungry continent

renewable energy provides *the* option for rural electrification in isolated or remote rural areas with no access to electricity, extension of the national grid is often not cost-effective compared with distributed power generation.

combining solar with micro grids, biomass and biogas power generation will shape clean solutions for electrification on the village scale.

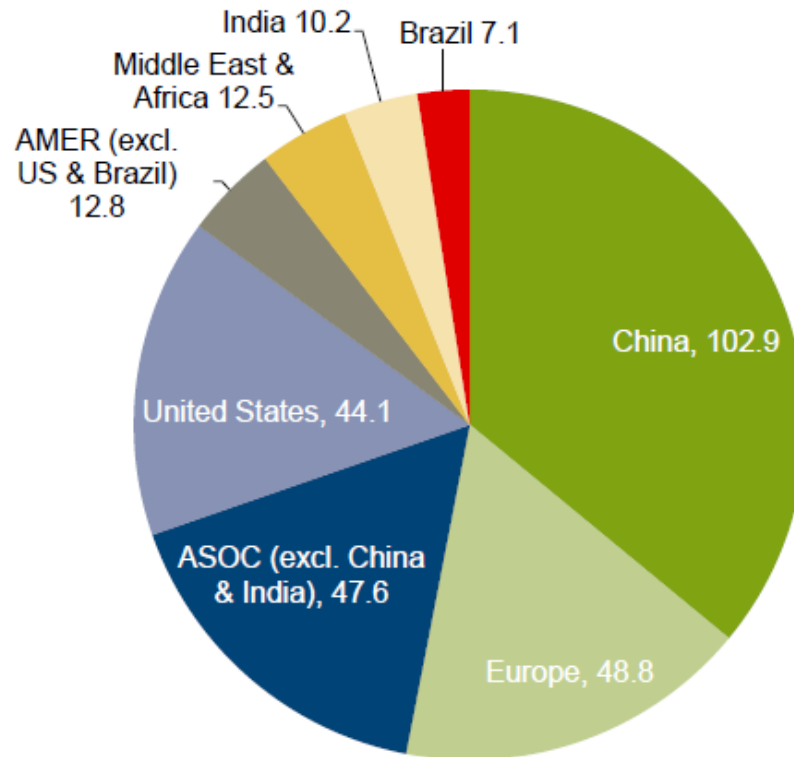
energizing development with newbies

governments in the region are setting targets for solar energy in their energy mix to improve the security of energy supply.

RE based power has 3 interlinked components:
knowledge management;
project development; and
innovative finance

energizing development with newbies

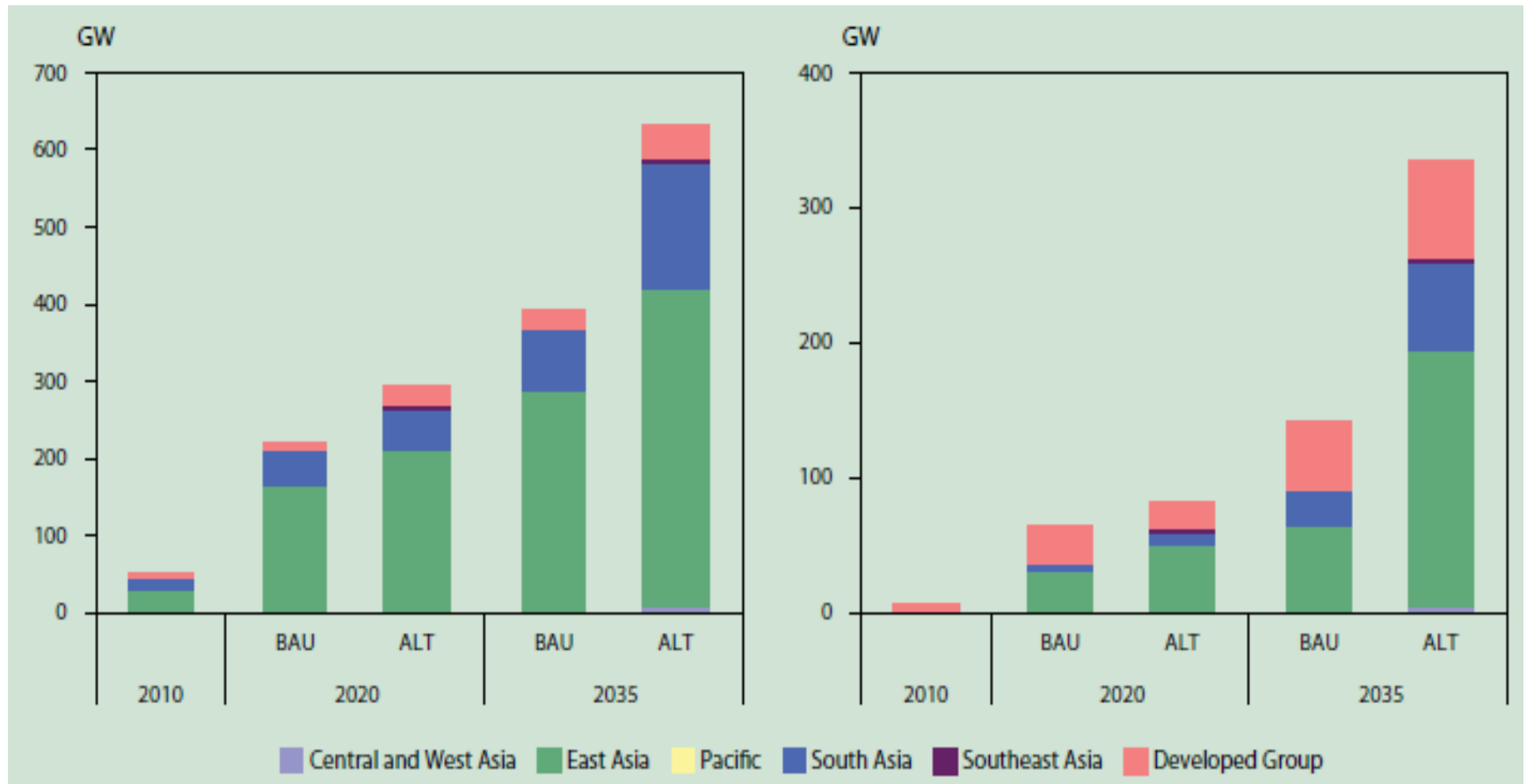
GLOBAL NEW INVESTMENT IN RE BY REGION, 2015 (\$BN)



Source: Bloomberg New Energy Finance;
UNEP

energizing development with newbies

Asia's installed capacity of wind and solar power



energizing development with newbies

Global New Investment in Renewable Power and Fuels, Developed and Developing Countries, 2004–2014



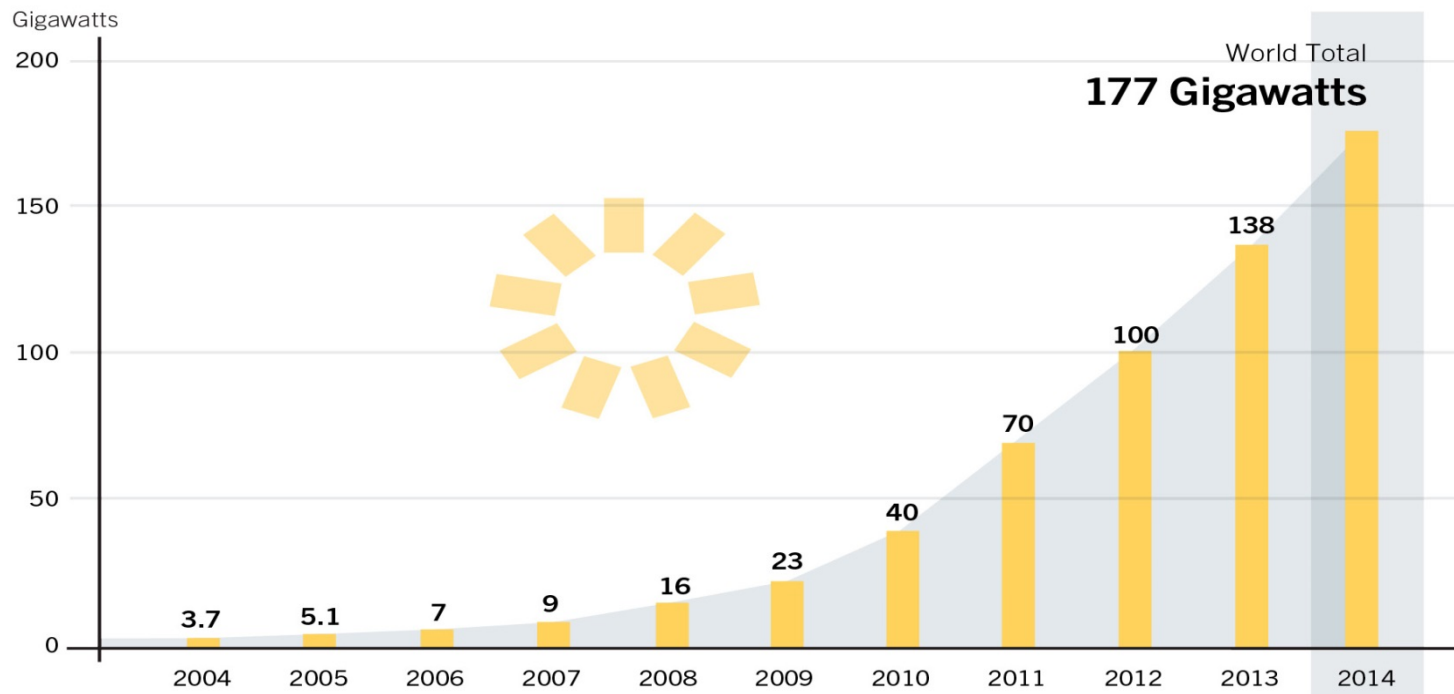
REN21 *Renewables 2015 Global Status Report*



Source: Frankfurt School–UNEP and BNEF

energizing development with newbies

Solar PV Global Capacity, 2004–2014



energizing development with newbies

mainstreaming RE: key findings for policymakers

develop stable and realistic policies
adaptable to changing environments

showcase and demonstrate ability of RE to provide
large-scale electricity supply

create a conditions promote
technology and cost- competitiveness

RE power: good decisions with good data

let's think about eclectic systems instead: energy and society

decentralized and distributed solar power generation for remote rural communities will result in economic benefits derived from improved social and rural development.

let's think about eclectic systems instead: energy and society

knowledge management is the key element to catalyze the Asian solar market growth potential by triggering innovation and efficiency, eventually consolidating solar energy as the main ingredient of regional transformation from a carbon-based towards a renewable energy-based society.

let's think about eclectic systems instead: energy and society

while wider electricity coverage through expanded and strengthened transmission and distribution networks in rural areas is essential, it is important **to go beyond the meter** (i.e., counting the number of new connections installed) by ensuring that these connections include poor and disadvantaged communities and provide cash-making options.

let's think about eclectic systems instead: gender and energy

beyond the meter: gender and energy

the growing use of RE energy presents special opportunities to promote the involvement of women in the energy sector. rural electrification do benefit women by reducing their household labor time, improving access to health services, improving security, and creating income generating opportunities.

small is beautiful: autarchic off-grid power solutions

compact hybrid system in Bangladesh



small is beautiful: autarchic off-grid power solutions

compact hybrid system in Bangladesh



summary of opportunities for deployment of RE in Asia

combining solar with micro grids, biomass and biogas power generation will shape clean solutions for electrification on the village scale: *small is beautiful*

beyond the meter: gender and energy

RE based power has 3 interlinked components:

knowledge management;
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develop stable and realistic policies
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showcase and demonstrate ability of RE
to provide large-scale electricity supply

create a conditions promote technology
and cost- competitiveness

RE power: good decisions with good data

Variable renewables are re-shaping
the business models and how grid
infrastructure it being designed.

biomimicry or inspired by nature

nature runs on sunlight.
uses only the energy it needs.
fits form to function.
recycles everything.
rewards cooperation.
banks on diversity.
demands local expertise.
curbs excesses from within.
taps the power of limits.

biomimicry or inspired by nature

10 of nature's unifying patterns: the new power engineering

1. it uses only the energy it needs and relies on freely available energy
2. it recycles all materials
3. it is resilient to disturbances.
4. it optimizes rather than maximizes.
5. it rewards cooperation.
6. it runs on information.
7. it uses chemistry and materials that are safe for living beings.
8. it builds using abundant resources, incorporating rare ones only sparingly.
9. it is locally attuned and responsive.
10. it uses shape to determine functionality.

biomimicry or inspired by nature

<http://www.bloomberg.com/news/articles/2016-04-07/8-innovations-inspired-by-nature-s-genius>

<https://www.youtube.com/watch?v=CMI95MP23yM>

<https://www.youtube.com/watch?v=sf4oW8OtaPY&feature=youtu.be>

discussion

do not go where the path may lead, go instead where there is no path and leave a trail.

Ralph Waldo Emerson (1803- 1882), leader of the transcendental movement



Questions



Answers



Thank you

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