



# Renewable Energy

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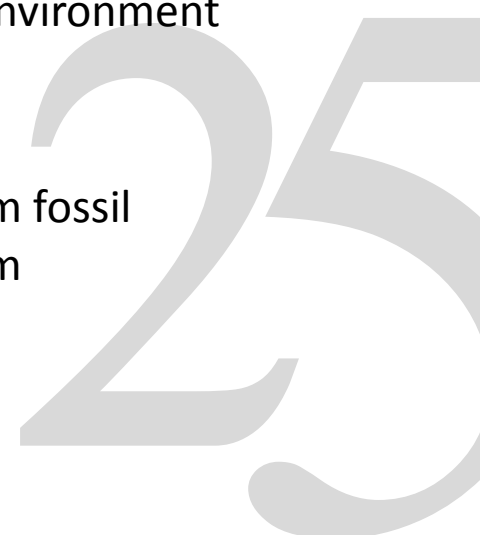
**Rated “A-“ by S&P and A.M. Best**, our geographical scope includes the Middle East, Africa, Asia, CEE, SEE and CIS countries. Trust Re provides reinsurance protection to many leading direct insurance companies in its geographical area of operation, in the form of annual Treaties on proportional and non-proportional bases with a sizable underwriting capacity. We offer Facultative reinsurance in the following classes: **Oil & Energy (offshore and onshore), Marine Hull & Cargo, Alternative Energy, Property, Engineering and Specialty Lines**. Our service offering has recently been expanded to include Life and Health reinsurance.

# Renewable Energy Defined

Power generation from any energy source that is naturally regenerated over a short time scale from which it is derived:

- **Directly** from the sun (such as thermal, photochemical, and photoelectric),
- **Indirectly** from the sun (such as wind, hydropower, and photosynthetic energy stored in biomass),
- or from **Other** natural movements and mechanisms of the environment (such as geothermal and tidal energy).

Alternative energy **does not include** energy sources derived from fossil fuels, waste products from fossil sources, or waste products from inorganic sources.



- **Renewable Energy – “any sustainable energy source that comes from natural environment.”**
- **Some Facts of Renewable Energy**
  - It exists **perpetually** and in abundance in the environment
  - Ready to be harnessed, **inexhaustible**
  - It is a **clean alternative** to fossil fuels
  - **“energy that is derived from natural process that are replenished constantly”** -- defined by the RENEWABLE ENERGY WORKING PARTY of the INTERNATIONAL ENERGY AGENCY (IEA)

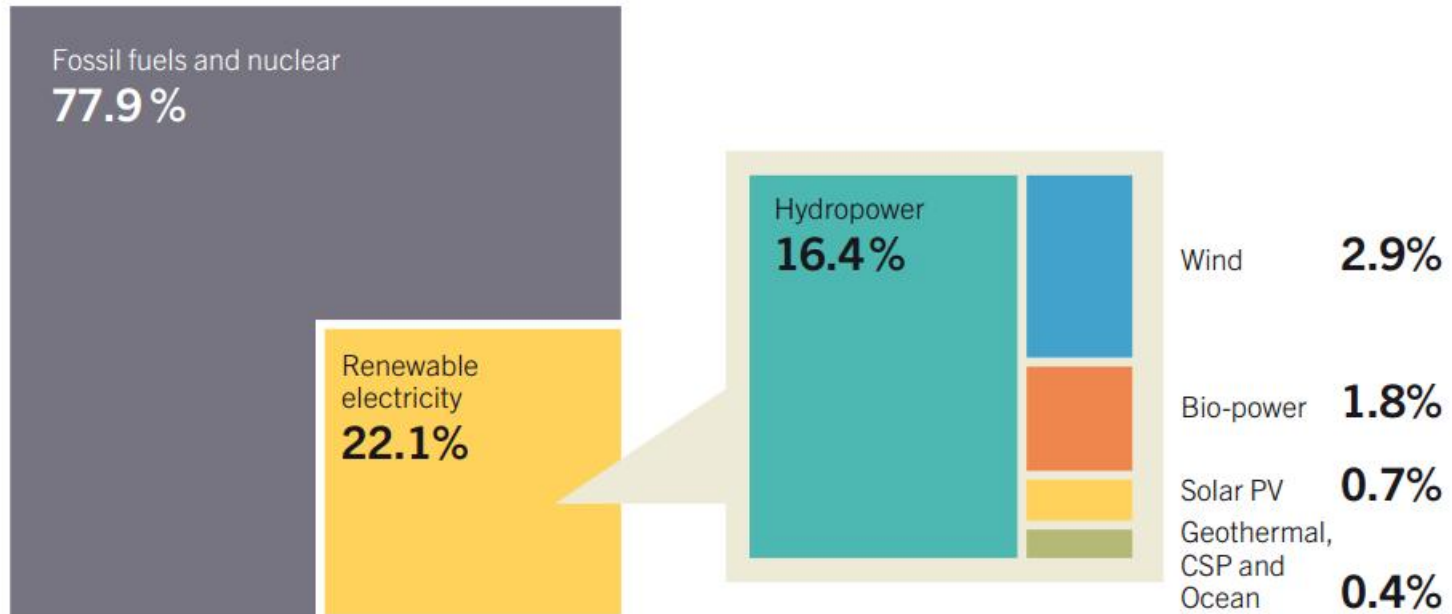


# Major Renewable Energy Sources

- Hydro Energy
- Wind Energy
- Solar (PV/CSP) Energy
- Biomass Energy
- Bio-fuel / Bagasse
- Geothermal Energy
- Wave / Tidal Energy

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## Estimated Renewable Energy Share of Global Electricity Production, End-2013



# Global Weather Facts

- Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide are increasing markedly as a result of human activities.
- Average global temperatures could rise between 1.1 and 6.4 degrees Celsius during the 21st century. This can vary greatly depending on the intensity of human activity and fossil-fuel usage.
- Sea levels will probably rise by 18 to 58 cm.
- There will be more frequent warm spells, heat waves and heavy rainfall.
- There will be an increase in droughts, tropical cyclones and extreme high tides.

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# Insurance Facts

Climate Driver	Natural Changes	Insurance Exposure
Warmer Water Temperatures	<ul style="list-style-type: none"><li>▪Ice Melting</li><li>▪Sea Level Rising</li><li>▪Water Level Rise in Delta Rivers</li><li>▪Tropical Storms</li></ul>	<ul style="list-style-type: none"><li>▪Floods</li><li>▪Stronger Wind Patterns</li><li>▪Shorter NAT CAT return periods</li><li>▪Higher than historically assumed costs by extreme events</li></ul>
Warmer Air Temperature	<ul style="list-style-type: none"><li>▪Drought</li><li>▪Heat Waves</li></ul>	<ul style="list-style-type: none"><li>▪Agricultural Damages</li><li>▪Health and Medical</li></ul>



# Global Policies

- Formation of conventions by the UN and public bodies to consider what can be done to reduce global warming
- Kyoto Protocol: Legally binding targets to reduce greenhouse gas emissions.
- The Clean Development Mechanism (CDM)
- G8 countries planning to reduce global CO2 emissions by 2050 by 50% of the level in 1990
- European Union: to increase the share of renewable energy sources by 20% by 2020.
- By 2030, renewable energy sources supplying 30% of the world's electricity

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# Challenges summarized

RET	Challenge
Solar Thermal Power	<ul style="list-style-type: none"> <li>●High investment costs</li> <li>●High transit risk that can lead to delays</li> <li>●Manufacturer performance risk</li> </ul>
Onshore Wind farms	<ul style="list-style-type: none"> <li>●Weather cannot be influenced and hence earnings can easily be blown away</li> <li>●Manufacturer performance</li> <li>●Grid tie-up</li> </ul>
Offshore Wind farms	<ul style="list-style-type: none"> <li>●Expensive due to transit and installation costs</li> <li>●Challenging environments</li> <li>●Laying of cables to onshore grid</li> </ul>
Geothermal	<ul style="list-style-type: none"> <li>●Water temperature data is very limited</li> <li>●Flow rate cannot be predicted</li> <li>●High drilling costs</li> <li>●Can be hazardous</li> </ul>
Hydropower	<ul style="list-style-type: none"> <li>●Expensive</li> <li>●Planning and obtaining enough hydrological and geological in nature.</li> <li>●Farming population</li> <li>●Consistency of Water / Rain Fall</li> </ul>

# Insurance challenges

- Exposure to major perils and natural catastrophes
- Credit worthiness of project participants / contractors / customers / suppliers
- Lack of previous experience of project participants, contractors, etc.
- Insufficient operating and maintenance procedures and practices
- Human failures such as malicious damage, carelessness, lack of foresight, unsafe working practice, lack of control, theft
- New / Prototypical / Scale up technology
- Faults in design material and workmanship
- Inherent technical perils in handling, erecting, testing and commissioning



# Renewable Energy & Global Investment

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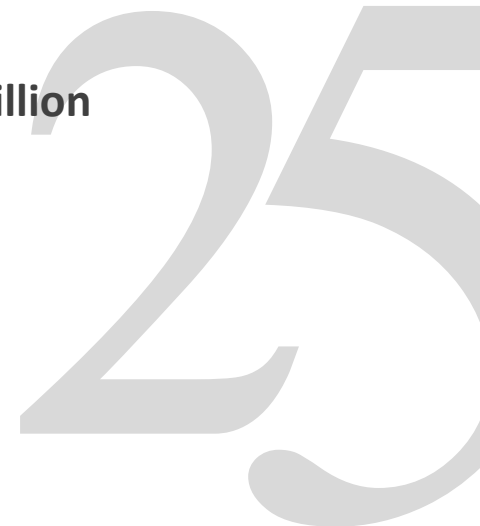
# As per Bloomberg's New Energy Finance study

- **Clean energy investment rose for the first time in three years in 2014**
- **New funds for wind, solar, biofuels and other low-carbon energy technologies gained 16 percent to US \$310 billion last year. This was the first growth since 2011, erasing the impact of lower solar-panel prices and falling subsidies in the U.S. and Europe that hurt the industry in previous years.**
- **Funding surged because of a 32 percent expansion in China's commitment to renewables, as well as a record \$19.4 billion committed to offshore wind projects.**
- **It is expected that the impact of cheaper crude will be felt much more in road transport than in electricity generation**
- **Expected installations for solar and wind power to grow about 10 percent this year**
- **Investment in Solar Power projects rose 25 percent to \$149.6 billion in 2014, its highest share of the total ever.**

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# As per Bloomberg`s New Energy Finance study

- **China was the biggest single contributor among the major markets for renewable energy, increasing its investment to \$89.5 billion**
- **The U.S. boosted its investment by 8 percent to \$51.8 billion, the most since 2012**
- **Japan, which has become the second-biggest market for solar power, lifted funding for renewables 12 percent to \$41.3 billion**
- **In Europe, which led the industry in installations in the first decade of this century, investment grew 1 percent to \$66 billion despite funding for offshore wind.**



## Top Five Countries

### ANNUAL INVESTMENT / NET CAPACITY ADDITIONS / PRODUCTION IN 2013

	1	2	3	4	5
Investment in renewable power and fuels	<b>China</b>	United States	Japan	United Kingdom	Germany
Share of GDP 2012 (USD) invested <sup>1</sup>	<b>Uruguay</b>	Mauritius	Costa Rica	South Africa	Nicaragua
 Geothermal power capacity	<b>New Zealand</b>	Turkey	United States	Kenya	Philippines
 Hydropower capacity	<b>China</b>	Turkey	Brazil	Vietnam	India
 Solar PV capacity	<b>China</b>	Japan	United States	Germany	United Kingdom
 CSP capacity	<b>United States</b>	Spain	United Arab Emirates	India	China
 Wind power capacity	<b>China</b>	Germany	United Kingdom	India	Canada
 Solar water heating capacity <sup>2</sup>	<b>China</b>	Turkey	India	Brazil	Germany
 Biodiesel production	<b>United States</b>	Germany	Brazil	Argentina	France
 Fuel ethanol production	<b>United States</b>	Brazil	China	Canada	France

# Renewable Energy

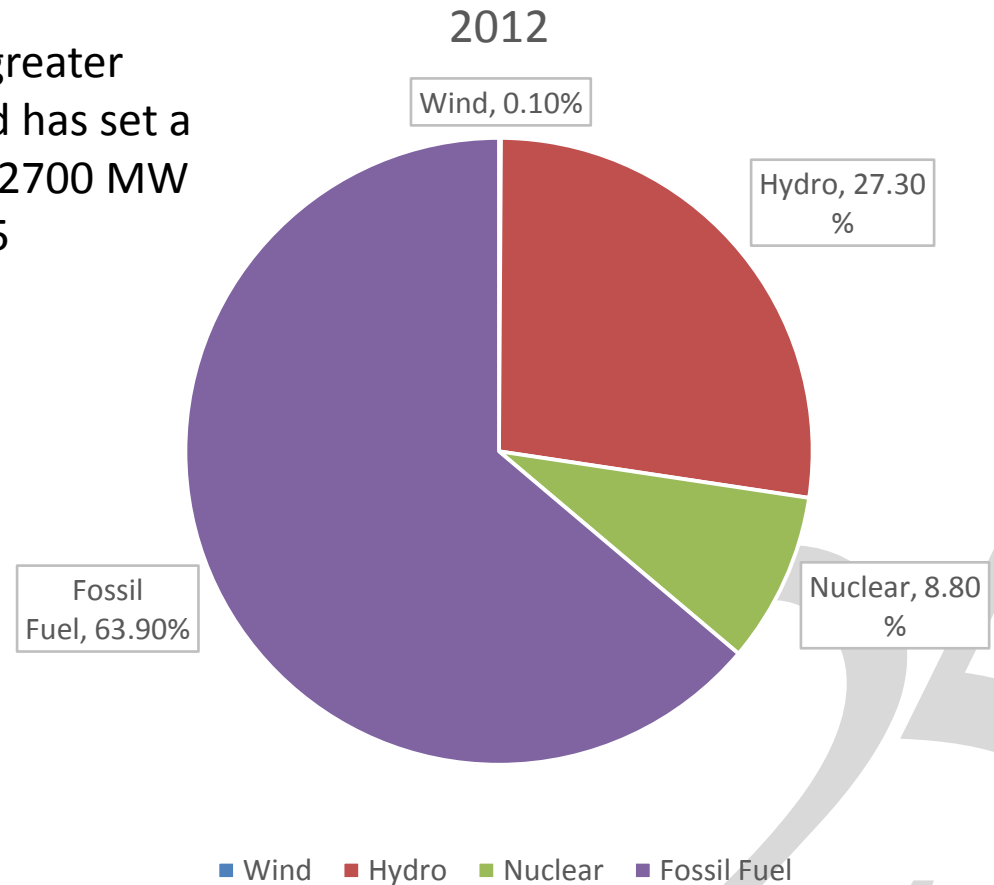
## Pakistan

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# Power Sector in Pakistan

Government of Pakistan is putting greater emphasis on Renewable Energy and has set a target of 10% renewable energy or 2700 MW in the Country's energy mix by 2015



- Considering geographical and climatic conditions, Pakistan is well placed for more plausible but technological matured renewable energy source like Wind (both onshore and offshore wind energy), Photovoltaic (PV) technology and Biomass
- Only wind energy source in fact has capacity to collectively produce over 150,000 MW of electricity in Pakistan
- Pre-requisite for producing and utilizing wind energy is the availability of necessary wind speed. An average acceptable wind speed in most parts of the world lies from 6.2 – 6.9 m/s (fair category) and 7.0 – 7.4 m/s (good category)
- Interestingly, wind speed in some parts of Pakistan (e.g., Sindh corridor, Baluchistan and some northern areas) touches even excellent category of wind speed (i.e. more than 7.4 m/s)

# Renewable Energy in Pakistan

- The government has reversed course and eliminated a 32.5 percent tax imposed on imported solar equipment in the country's 2014-2015 budget.
- The aim is to bring down the cost of installing solar panels
- Introduction of net metering to sell through the national grid
- Sector would import around 800 megawatts of solar panels in 2015 to meet the demand
- Around 22 solar power projects having a cumulative capacity of 772.99 MW are under different stages of development and can achieve commercial operation by 2015-16

# Upcoming Wind Projects in Pakistan

- 10 MW Wind Project of Ismail industries Ltd in Sindh (Sindh; Pakistan)
- 50MW Wind Power Project of China International Water and Electric Power (CWE) in Jhampir (Sindh; Pakistan)
- 50MW Wind Power Project of New Park Energy in Gharo (Sindh; Pakistan)
- 10 MW Wind Project of Albario Energy in Sindh (Sindh; Pakistan)
- 2MW Solar PV Power Project in Punjab.

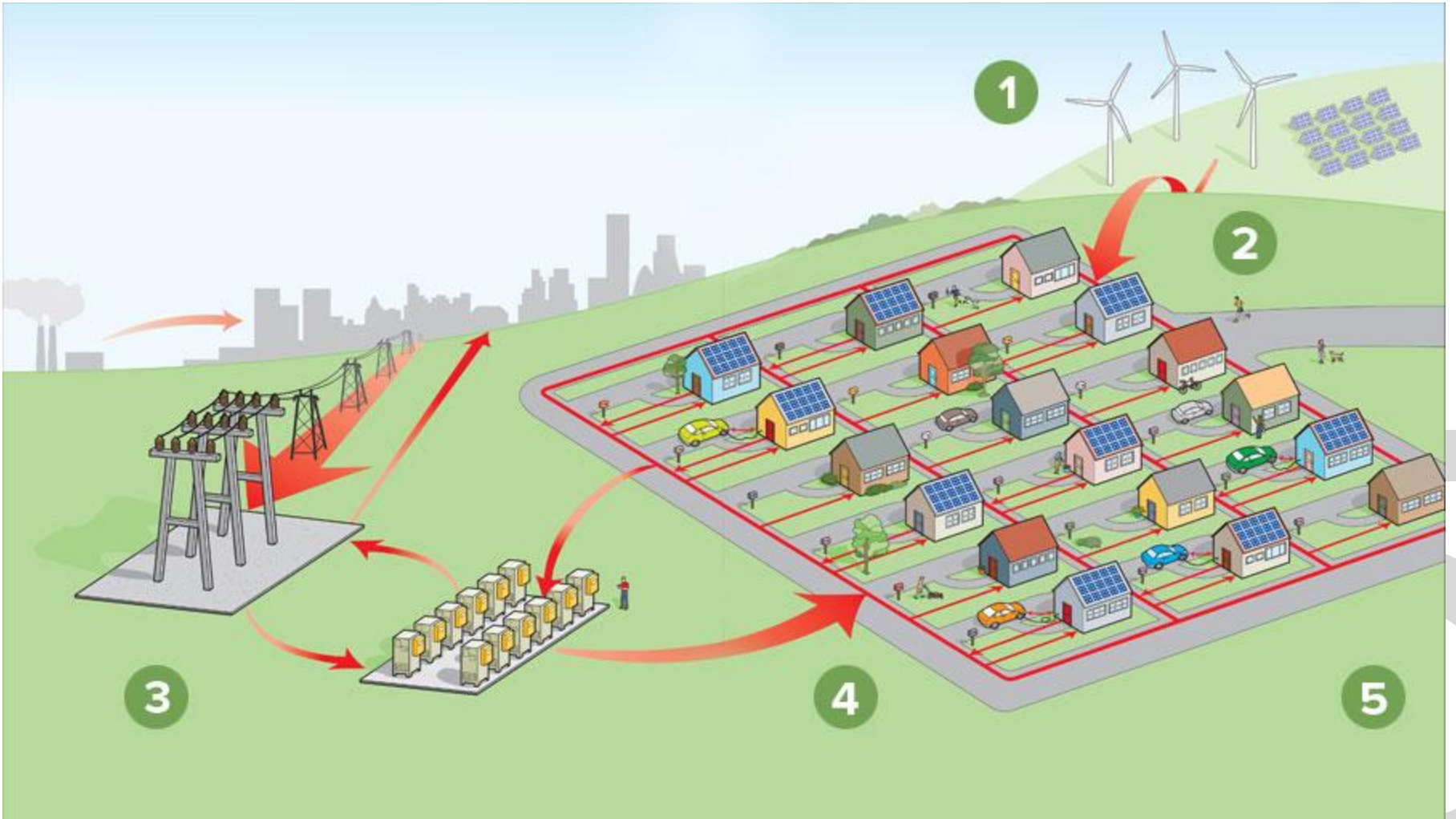


# Renewable Energy

## MicroGrid

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# Independence



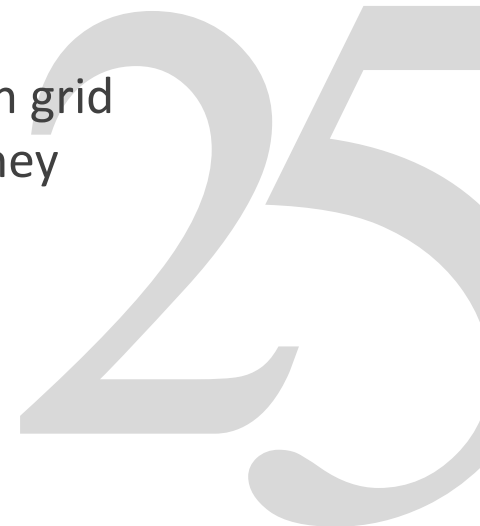
# What is it?

- Excellent for Rural / Urban development
- Scaled down version of the usual power grid
- Can range from a Diesel Generator to Distributed Energy Resources line Renewables
- Can operate independently or in conjunction with main grid



# What is it?

- Increased efficiency
- Demand on the microgrid infrastructure is less than a typical grid
- Microgrids are laid out in a modular manner making expansion and updating more efficient
- With local control, both design and future planning are specific to the needs of the entities participating in the microgrid
- Because the microgrid can shut itself off from the main grid (islanding) it is less vulnerable to outside attacks, be they cyber or physical





Global investment is progressing towards renewable energy for its reliability, versatility to support different sizes of power demands, stable benefits and lower technological complexities.

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# Thank You



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