WORLD BANK GROUP | KOREA GREEN GROWTH TRUST FUND | Ministry of Economy and Finance | Jeju 제주특별자치도 Jeju Special Self-Governing Province

Energy Sector Overview- The Need To Go Smarter!

Mongolia Energy Team

Joint KGGTF-ESMAP
Energy Breakout Session

ESMAP
Energy Sector Management Assistance Program

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1. Sector Overview

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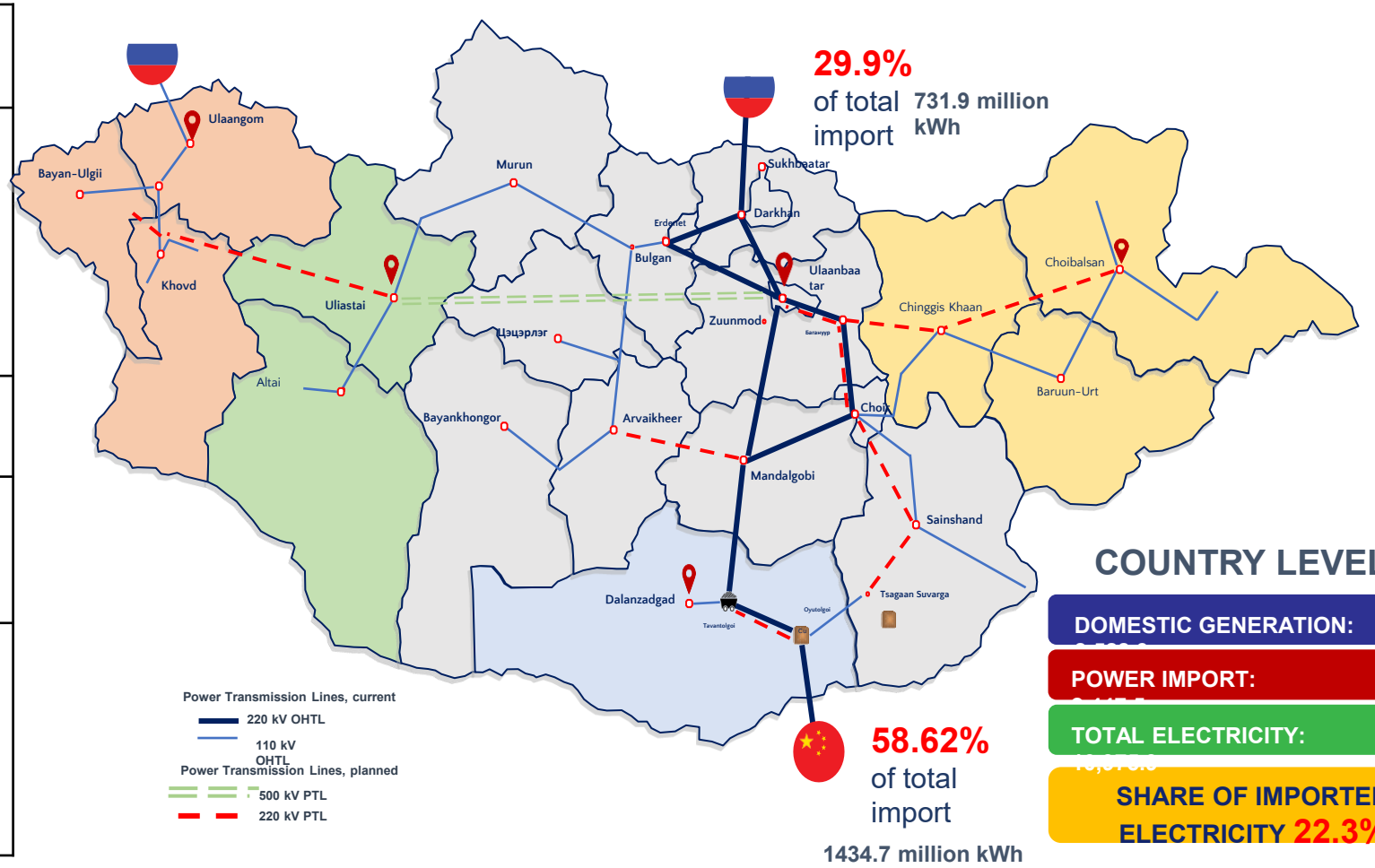
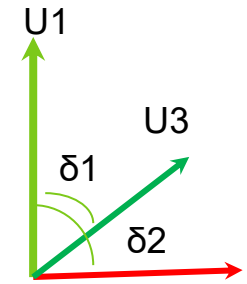
Current state and Challenges of Mongolian power system

Load /MIN-MAX/	1000-1800 MW
Domestic Installed generation	CHP 76.7%, WF-9.5%, Solar-6.7% /1648 MW/ Concentrated in cities
Stability	No spinning reserve
Transmission Grid	**220 кV – 2300 km 110 кV - 4300 km /2GW/**
Renewable penetration	**Weak grid**, can not support higher percentage RE plants, reactive power compensation





COUNTRY LEVEL

DOMESTIC GENERATION:

POWER IMPORT:

TOTAL ELECTRICITY:

SHARE OF IMPORTED ELECTRICITY 22.3%

million kWh

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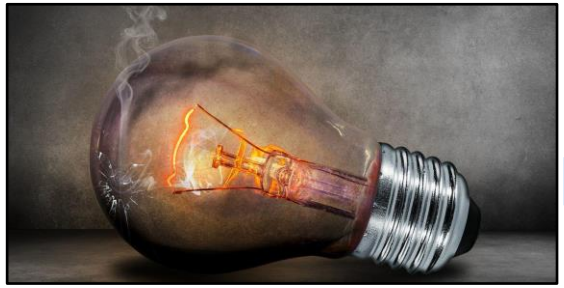
Current Crisis in Mongolia's Power System

BELOW COST RECOVERY TARIFF

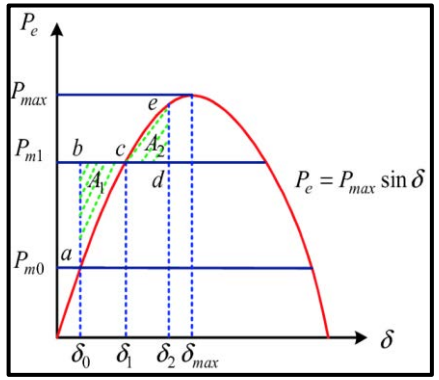
LOW INVESTMENT IN UPGRADATION AND NEW INFRASTRUCTURE

CANNOT SUPPORT SUSTAINABLE DEVELOPMENT GOALS



20%

&



Dependent on foreign country to meet demand

UTILITIES OPERATING ON SUBSIDIES FROM GOM

LOW INVESTMENT IN HUMAN CAPITAL DEVELOPMENT

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2. Sector need and future

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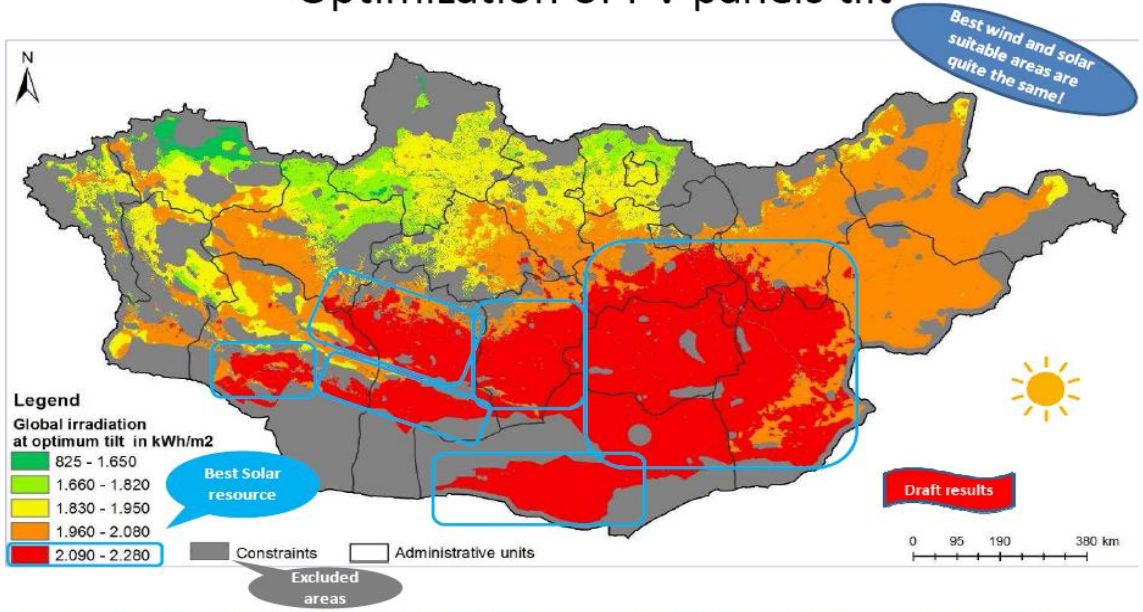
Renewable energy sources

2200 GW

Suitable areas for solar PV development
Optimization of PV panels tilt

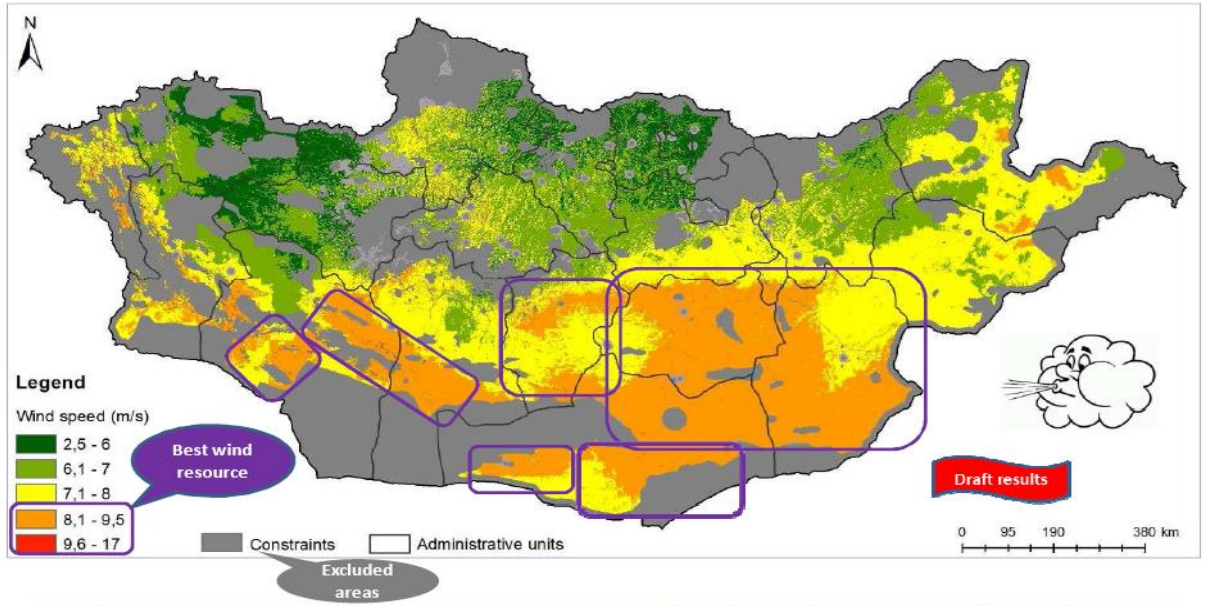


Based on Solargis solar data (Global Horizontal Irradiation -GHI). Optimization of PV panels tilt so as to increase performance: long term yearly average of daily totals of global irradiation at optimum tilt (GTI) 52

Mongolia has 270-300 clear sunny days a year and solar radiation is 2250-3300 hours at average.

1100 GW

Suitable areas for wind development



Interim results based on IRENA wind data. Update with new Vaisala wind data expected end of November 2017

Mongolia is abundant in wind resources – has potential to generate 7MW power from 1sq.meters site. Installed capacity of wind farms of 1,100,000 MW can generate 2.5 TWh power.

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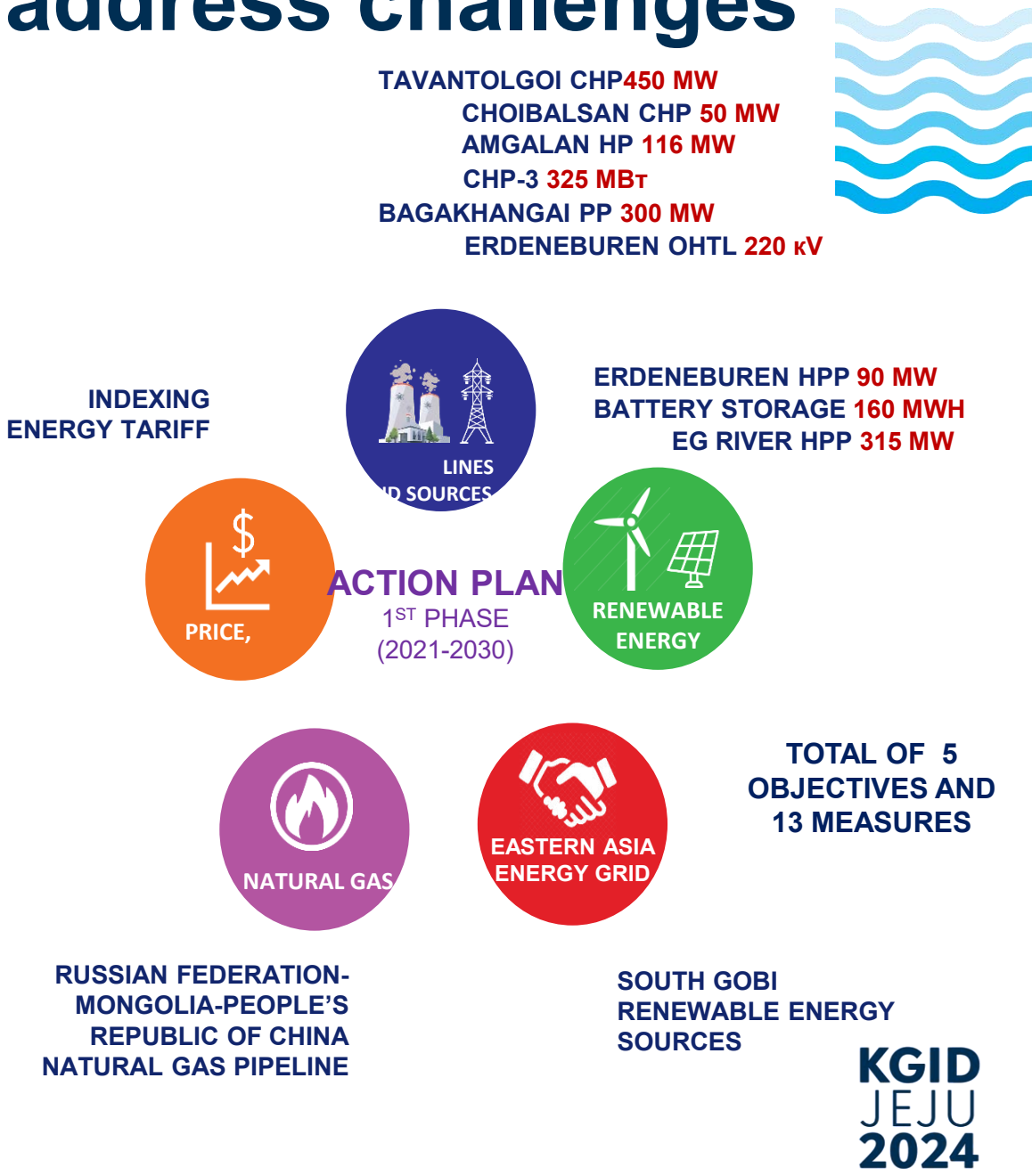
Policy and Reform efforts to address challenges

- New energy sources and transmission and distribution networks shall be established, and their existing capacity shall be enhanced, and the reliability of energy production and supply shall be improved.
- Renewable energy facilities shall be developed in an appropriate ratio where the energy storage system (BESS and Hydro) shall be built for ensuring the reliability and stability of the integrated energy system.
- Actions shall be taken to ensure the preparation of the high voltage aerial transmission lines and substations for connecting to the renewable energy source and network within the Northeast Asian integrated energy grid.
- The construction of a natural gas pipeline from the Russian Federation to the People's Republic of China through the territory of Mongolia shall be boosted.



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Policy and Reform efforts to address challenges

- Financial Reform
- Utilities Reform
- Policy Reform

80MIn USD

Privatization

14 Mega projects on Infrastructure

ATTRACTING INVESTMENTS

Reforms aligned with the "Vision-2050 long-term development policy document of Mongolia"

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Current Grid Features

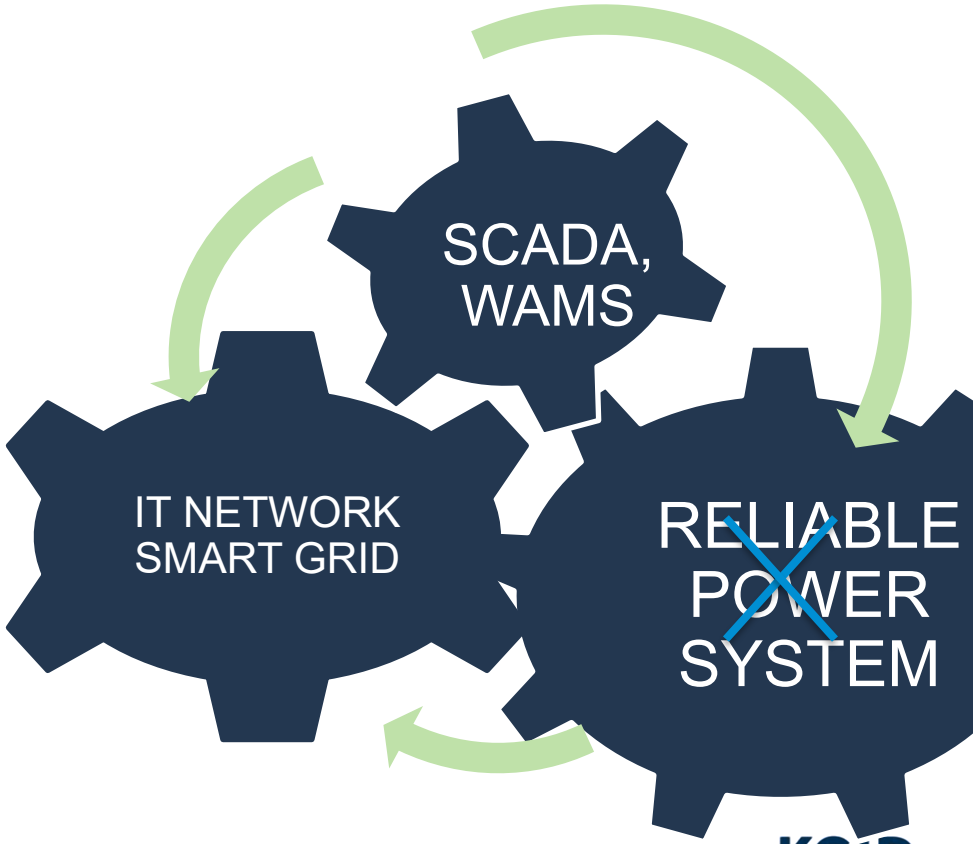
GRID NOW

- Stability Limit
- Old T&D System
- Supply Demand mismatch

☹

HOW SMART IT IS?

- x *Not Unified Smart Grid Platform*
- ✓ *Companies develop their own smaller IT network and implement SCADA, WAMS, METERING on smaller scale* 😳



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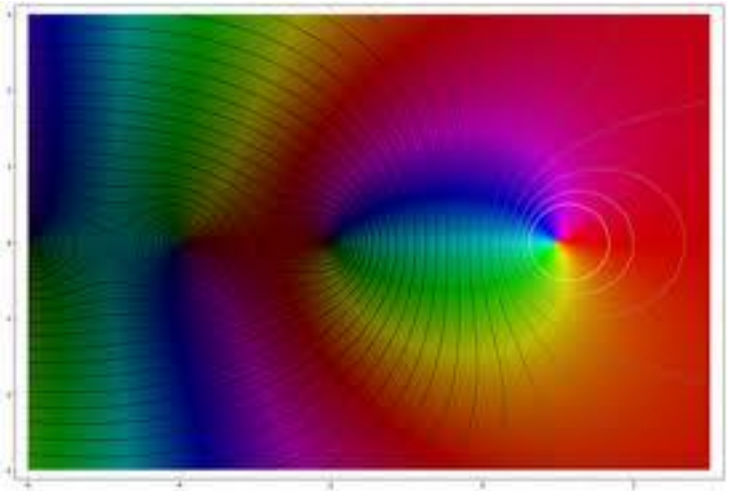
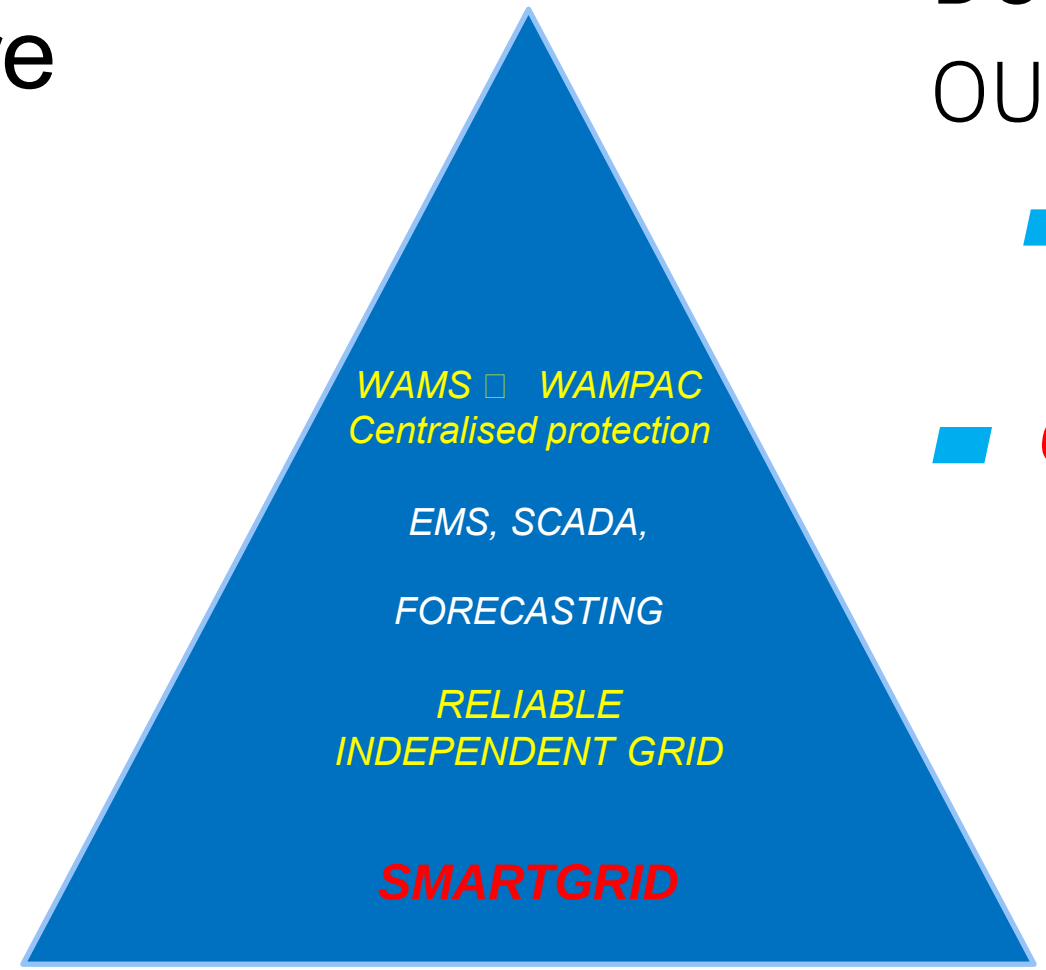
SMART **GRID - FUTURE**

GRID Now -Future



-VARIABLES



DOES IT MEET OUR NEEDS?

- *Smart grid is solution*
- *CAN SATISFY OUR FREQ AND VOLT STABILITY NEEDS-*

YES

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KGGTF and ESMAP Support

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Technical Assistance Support to Mongolia

- Energy Sector Planning and Tariff Reform Facilitation- May 2023
- Distribution network enhancement for renewable energy scale up- Ongoing
- Generation and Transmission planning- Ongoing
- Battery Energy Storage Assessment in Mongolia- Ongoing

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Technical Assistance Support to Mongolia

These assistance over the past years have provided vital inputs and key contributions to the GoM's to design its reform and have progressive way forward :

- Short Term: Increase tariff to ensure cost recovery, bring favorable policy to promote competition in generation sources and reduce losses of transmission and distribution with investment for upgradation of existing lines.
- Medium Term: Meet growing demand with commissioning of RE projects and storage systems (battery & pumped hydro). Ascertain coordinated planning of transmission, distribution, and generation with potential of distributed generation for remote areas, promote EE measures.
- Long Term: Ensure reliable, affordable, and sustainable supply to domestic demand, and make the sector green with reducing the reliance on coal-based power plants for heat and power.

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