ECONOMIC IMPACT ASSESSMENT OF ULAABAATAR POWER PLANT #5

June 2014

ECONOMIC RESEARCH INSTITUTE

Creating appropriate tariff system in power sector holds the future of the PP#5 project, while imminent need of new power source is soaring in UB

Key findings

Current situation

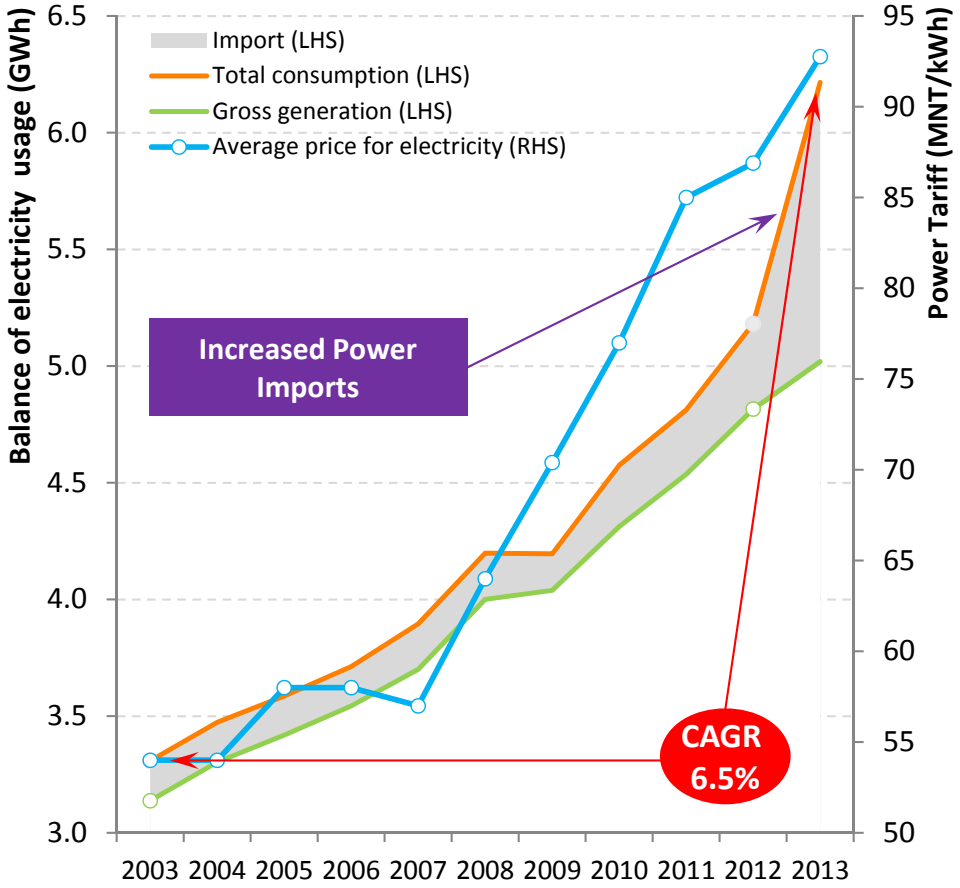
- Power demand has grown by ~57% since 2003 and is expected to grow 12% annually to 2020 mainly due to soaring demand from mining and industrial projects, most of them are located in South Gobi
- A material shortage is highly likely as ~70% of the installed capacity becomes obsolete in the next 5 years
- Thus, UB PP#5 is essential to address the near term supply shortage and fleet decommissioning but requires significant investment
- But attracting investment is challenging as the current energy sector is financially **inefficient** under fully regulated tariff system which is **unattractive** for investors
- Therefore, the GoM is in difficult position to make politically unfavorable decision to **release** current tariff system for power sector which will have **significant impact on price of goods** further

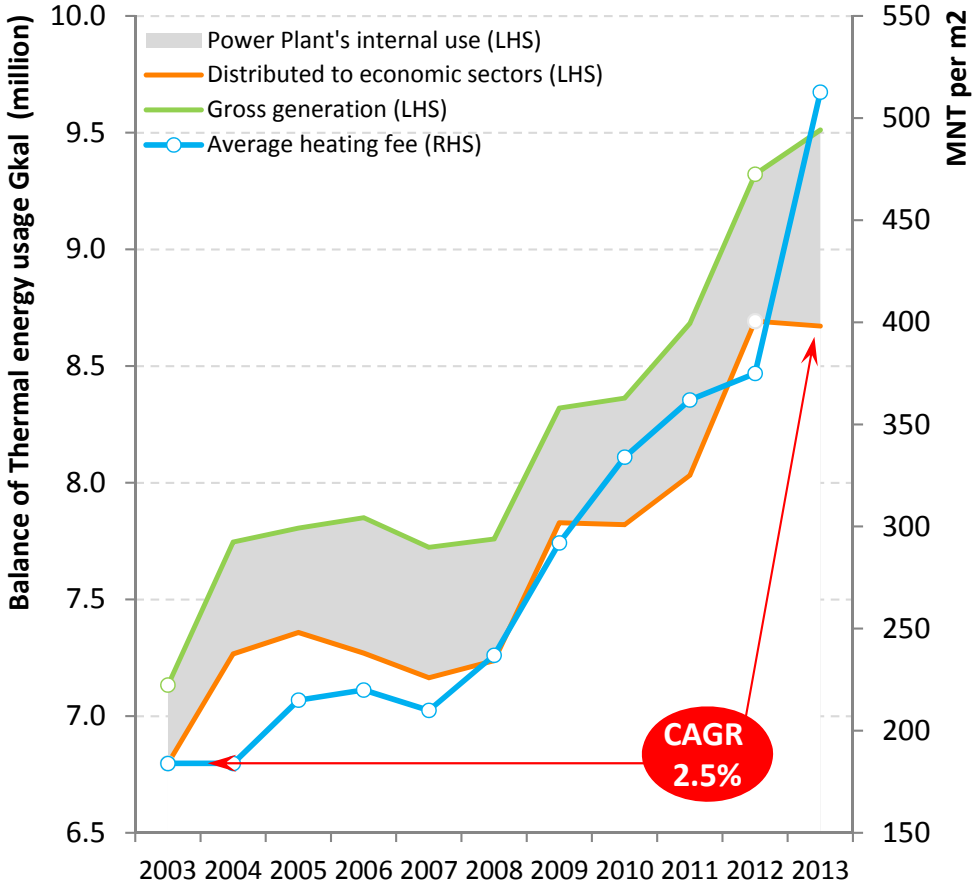
Future outlook

- A profitable tariff system in the power sector is required to prevent UB from pending power shortage by incentivizing private investment in the sector
- If we assume tariff issue is solved, **US$1.4** billion of investment is expected to be made for 3 years
- Although UB PP#5's impact on real GDP growth will be less than 1 percentage point, social impact of the PP#5 is enormous as decreasing pollution as replacing coal-heating with electricity and enabling a further expansion of the city
- Since PP#5 project has **high multiplier impact at 3.04**, its indirect impact to economy exceeds its direct impact, particularly, in labor market and state budget income

Power demand has grown by ~6.5% annually in the last decade due to increased urban migration in main cities including Erdenet, Darkhan and Ulaanbaatar

Power supply and demand in Mongolia



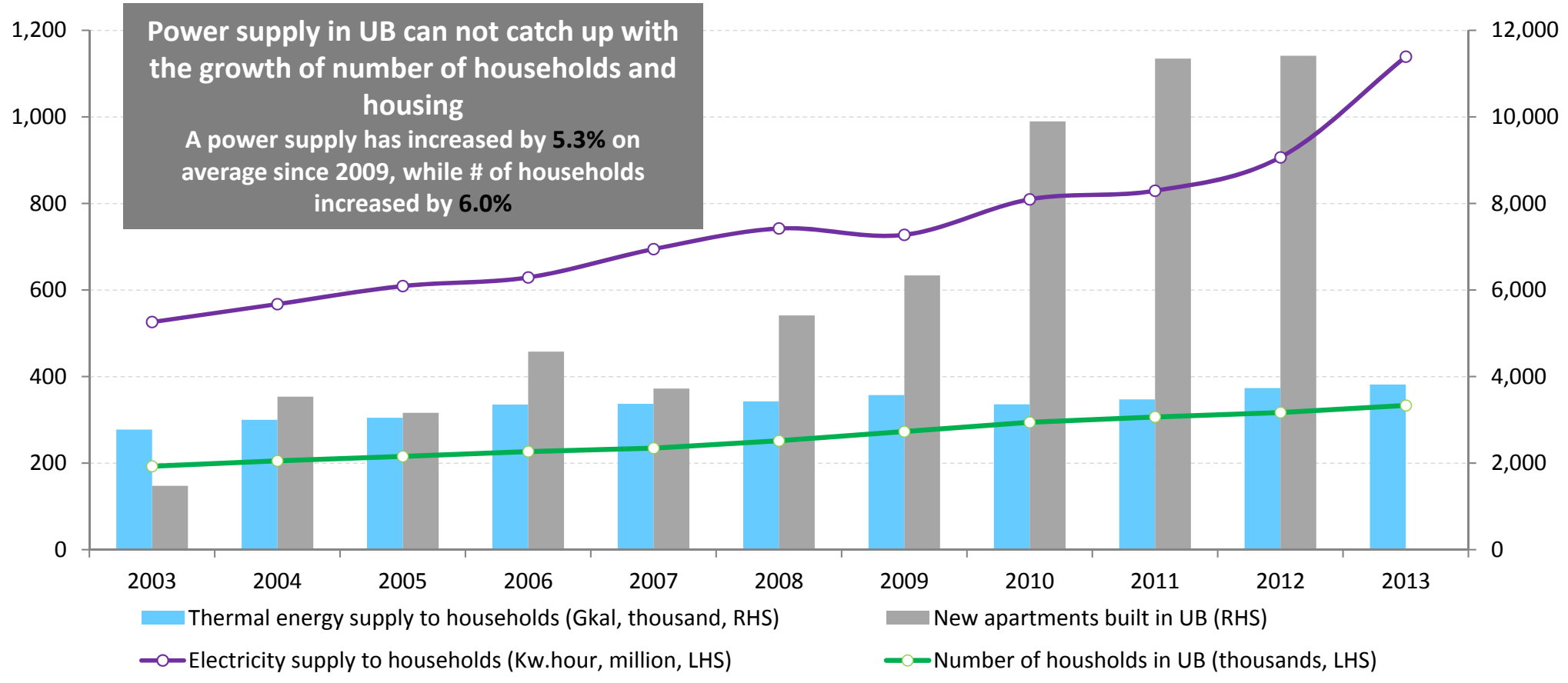


Even though, Power Plant #3 and #4 are planned to extend their current capacities by 150 MW in 2014, it can not be sustainable solution to maintain stable supply due to their over aged equipment that is unreliable

Source: NSO, Annual Reports

Recently launched GoM's programs to support construction sector are expected to push the power demand up significantly further mainly in urban areas

Household demand for power consumption in UB city

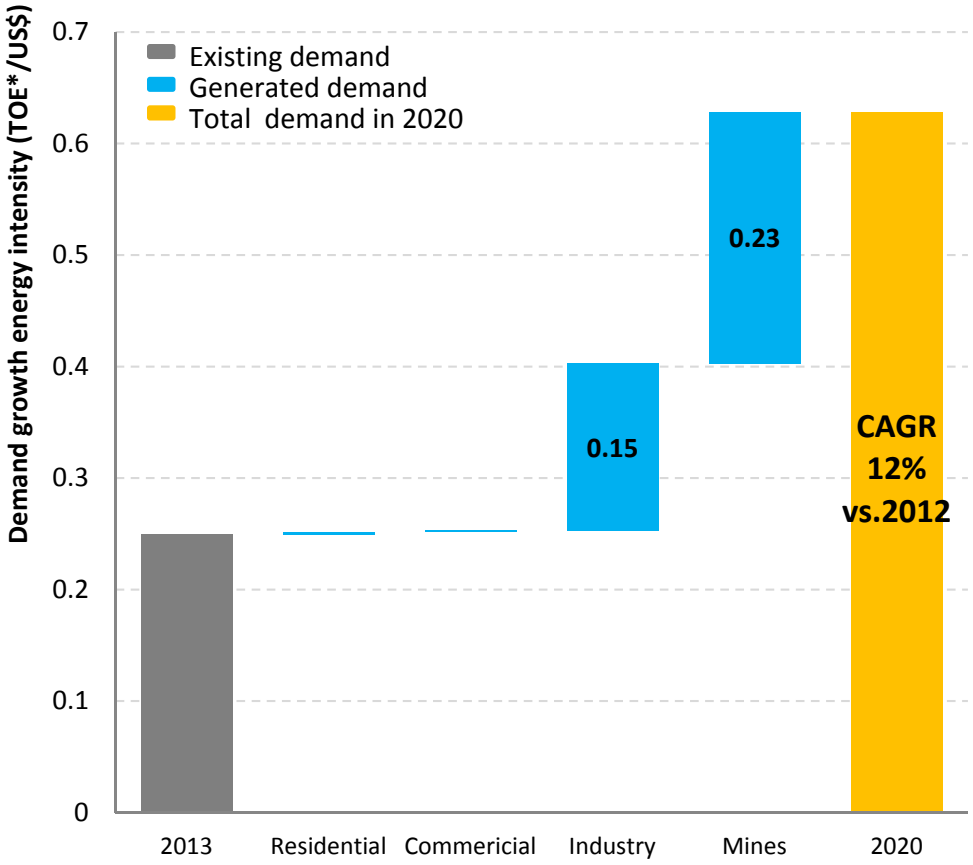


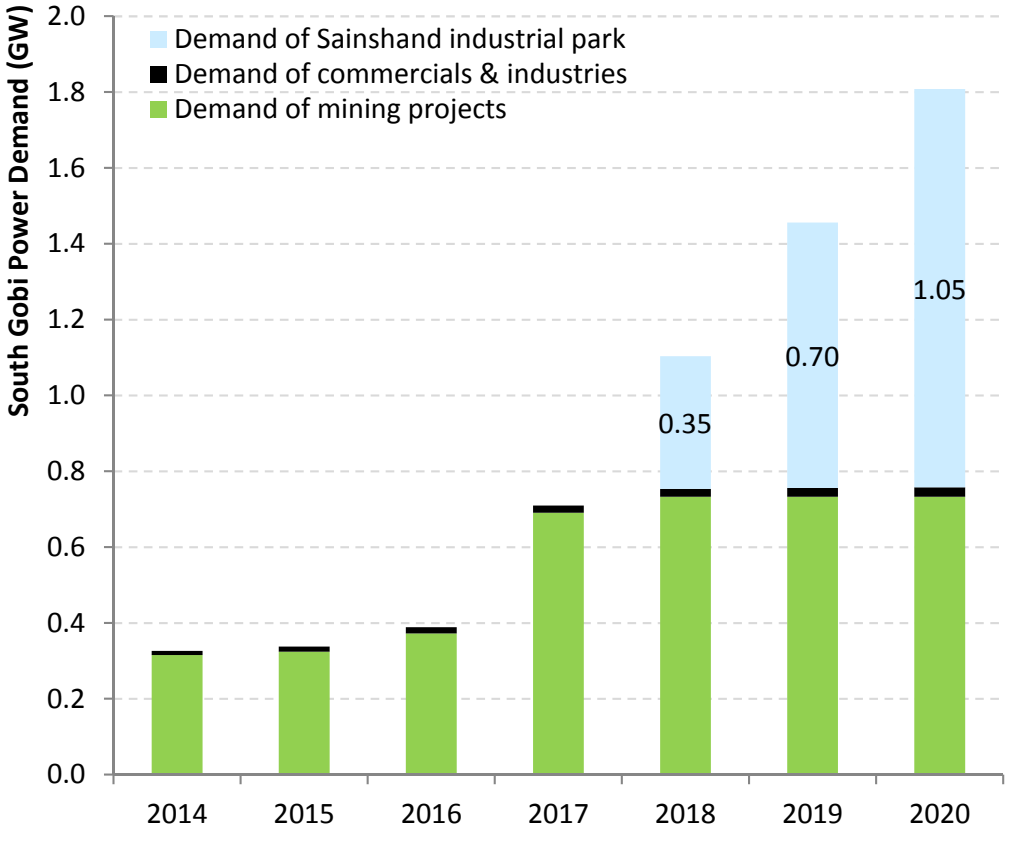
Increasing demand for thermal energy (heating) has exceeded capacity of power plant since 2010, resulting heating shortage in the east side of the UB

Sources : NSO, Annual reports

Addition to this, currently planned mining and industrial projects are expected to push the annual demand of power up to 12% till 2020, of which most of those projects are located in south side of the country

Power demand outlook





But before that, significant investment in high potential gridlines and transmission infrastructures needs to accompany with CES's expansion to south. The current CES linkage to SES is insufficient and old aged.

*Ton of oil equivalent

Despite plans for new generation, a material shortage is likely as ~70% of the installed capacity becomes obsolete in the next 5 years

Overview of Existing Power Generation capacity in the Central Energy System (CES)

No	Power plants	Available Electricity capacity (MW)	Share in CES	Available thermal energy capacity (Gkal hour)	Location	Year Installed	End of life
1	UB PP#1	36.0	4.6%	47	UB	1974	2007
2	UB PP#2	24.0	2.8%	31	UB	1961 – 1969	1999
3	UB PP#3	148.0	16.6%	518	UB	1973 - 1979	2013
4	UB PP#4	570.0	71.1%	1045	UB	1983	2014-2022
5	Erdenet Power Plant	28.0	3.4%	120	Erdenet	1987 – 1989	2021
6	Darkhan Power Plant	48.0	6.1%	181	Darkhan	1965-1986	1998-2019
	TOTAL	**646.8**	**100%**	**1895**			

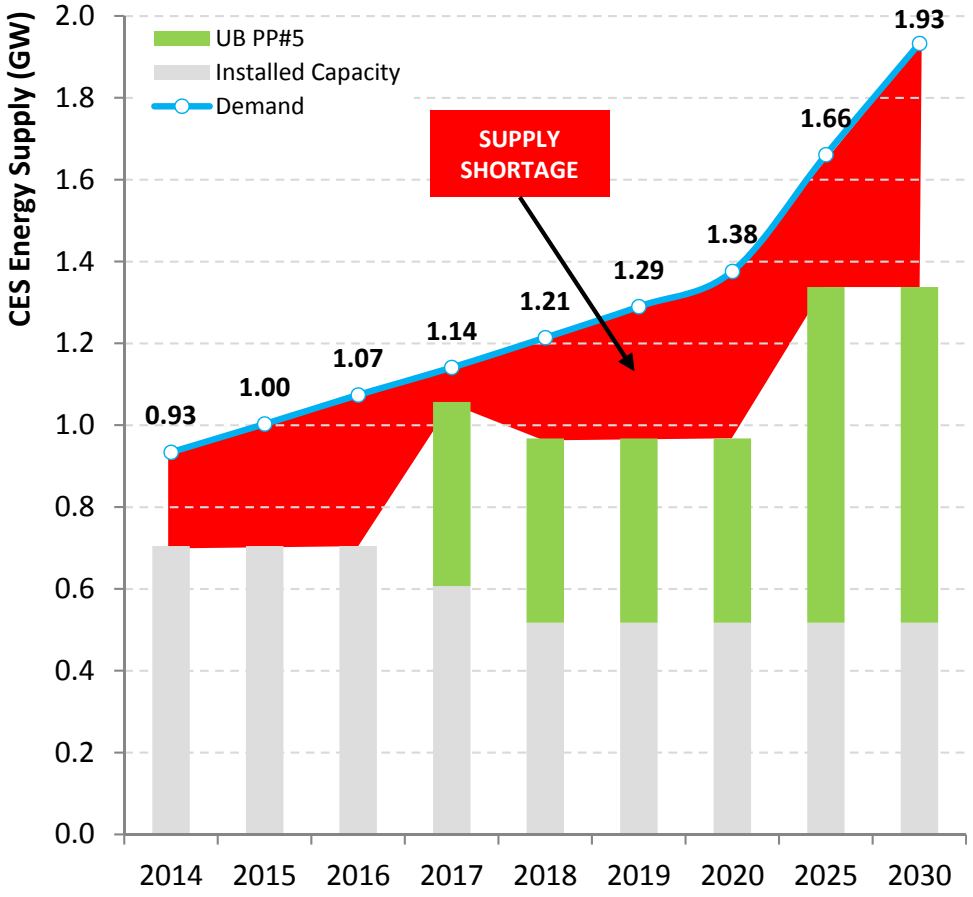
Combined to PP#3 after end of life

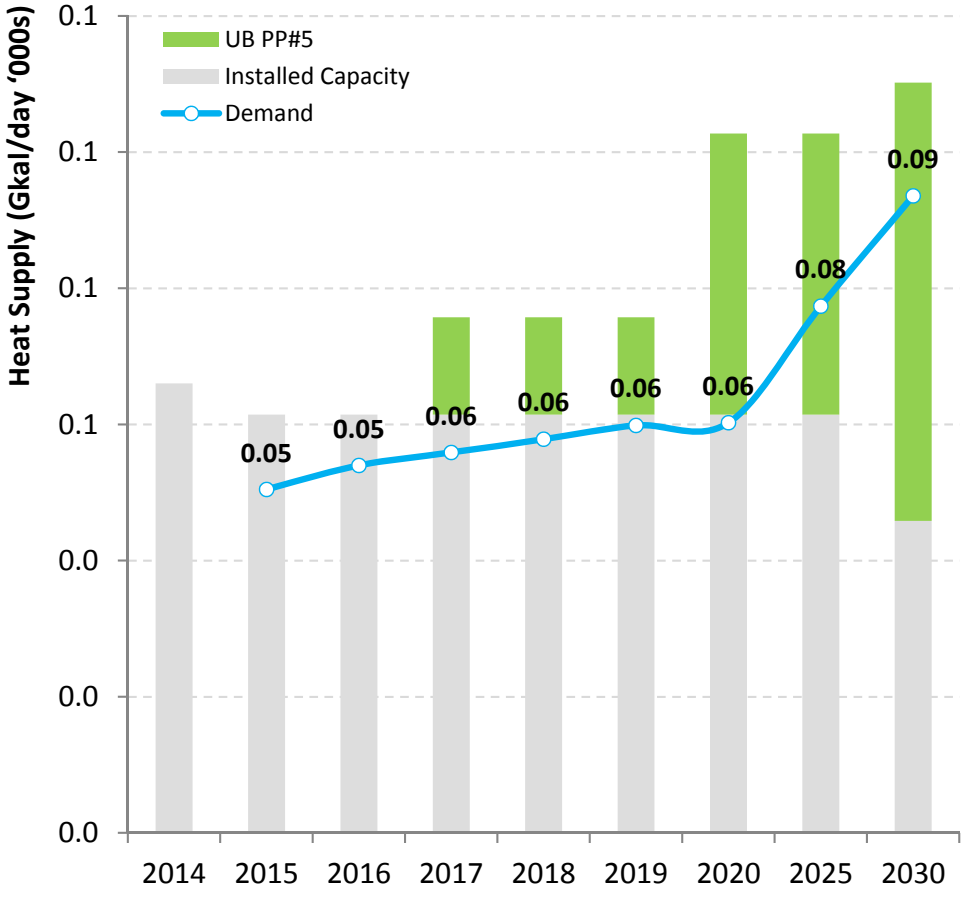
Although UB PP#4 is planning to expand its capacity by 150 MW in 2014, it is not a sustainable solution for stable supply due to the age of the overall generation fleet

Source: ADB 2011, Energy Authority, MMRE, Ministry of Energy

Thus, UB PP#5 is essential to address the near term supply shortage and fleet decommissioning but requires significant investment

Expected impact of UB PP#5 (CES* only)





Despite necessity of the power plant #5 is imminent in relation to intensive power demand in near future, continues effort to increase power capacity beyond the PP #5 is equally important

*Central Energy System

But attracting investment is challenging as the current energy sector is financially inefficient under fully regulated tariff system which is unattractive for investors

Key financial challenges for current power sector

Subsidised

The GoM controls power and heating prices (below market price), a MNT 40 billion subsidy each year. A number of thermal coal suppliers also operate at a loss (price of domestic coal is regulated)

Obsolete

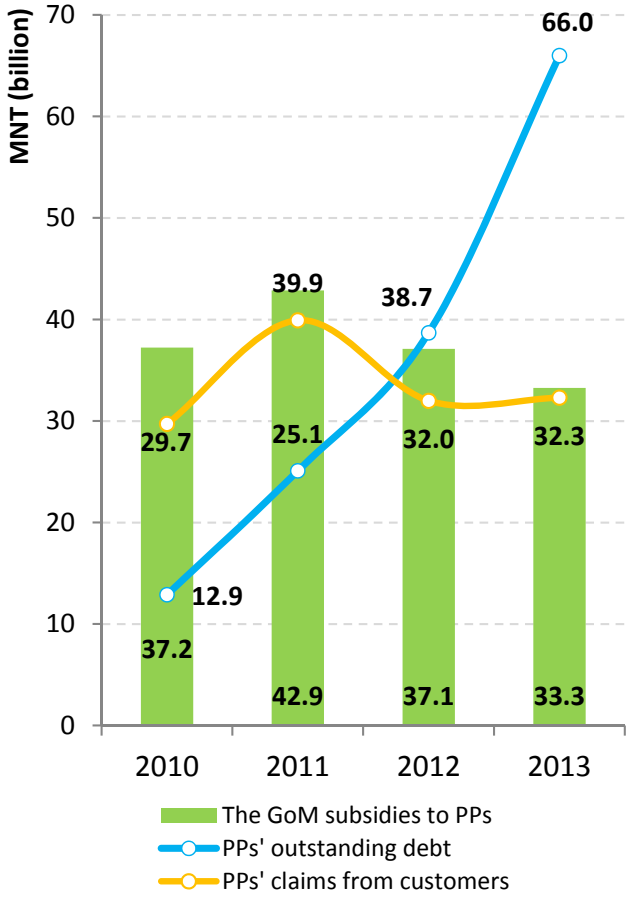
Technologies and equipment within the existing power plants are obsolete and inefficient and the operating costs are high. The latest PP built in CES was in 1983.

High debt burden

As a result of low price and high operating cost, debt burdens of the power plants are accumulated overtime and has reaching ~MNT 70 billion as of 2013. A key lenders to the power plants are mining companies that supply thermal coal

Inefficient

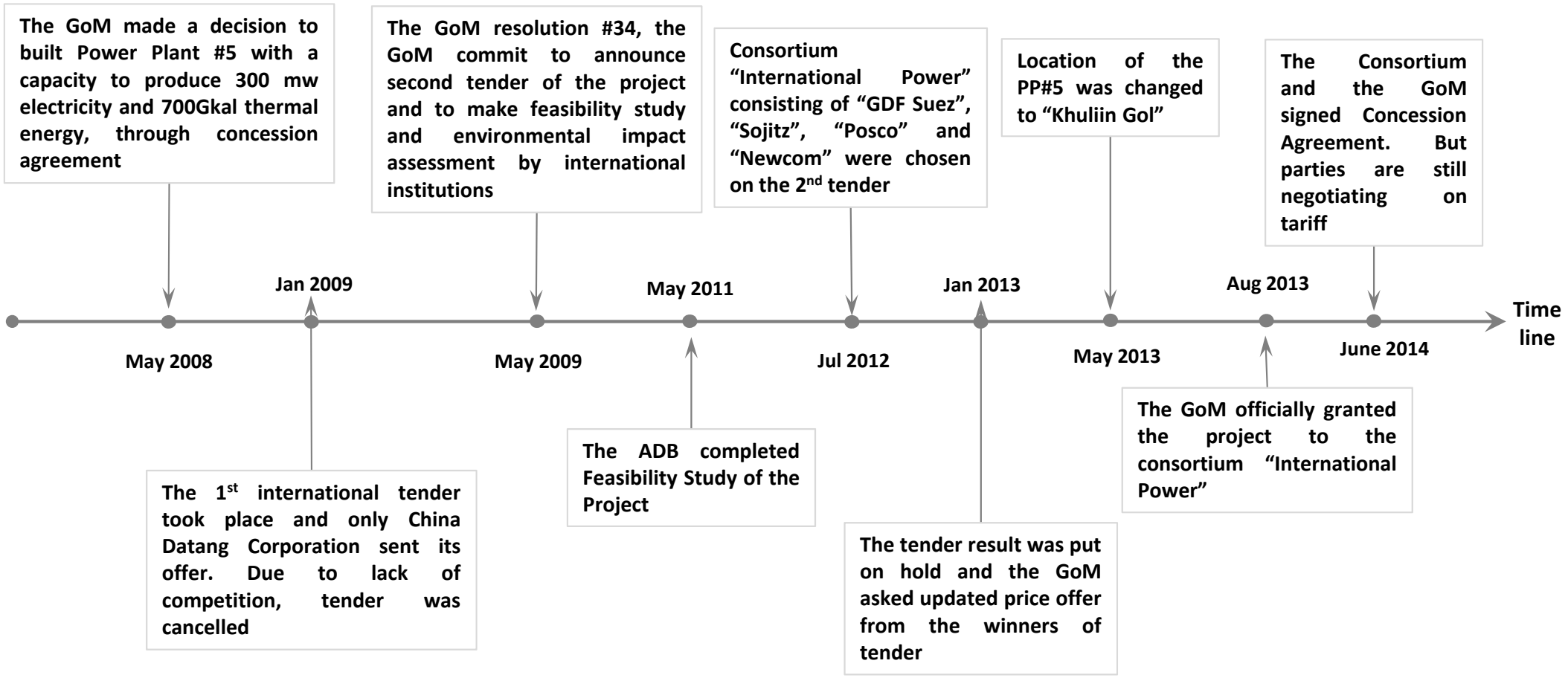
The additional demand that can afford to pay higher price is located in the south and the power sector lacks the needed infrastructure to be efficient



Source: MoF budget reports, Energy Authority, MMRE, Ministry of Energy

As solution to pending power supply shortage, the decision to build UB PP#5 by concession agreement was made in 2008, but work has progressed slowly since then

Timeline for the development of Power Plant #5 (PP#5)



Since UB PP#5 is a MEGA PROJECT that requires a large investment, the GoM has granted the project to private sector through CONCESSION AGREEMENT

Both technical and commercial challenges, particularly, tariff issues are holding back development of the project

Outstanding challenges

Land Issues

- The site for UB PP#5 was decided in 2008 but later changed in May 2013 due to technical reasons (too close to a major source of drinking water for UB). This created challenges in terms of cost structures and price estimations (ie high cost associated with releasing the new site from the current owners). Most of the area around the site had already been sold to private companies and individuals

Water Issues

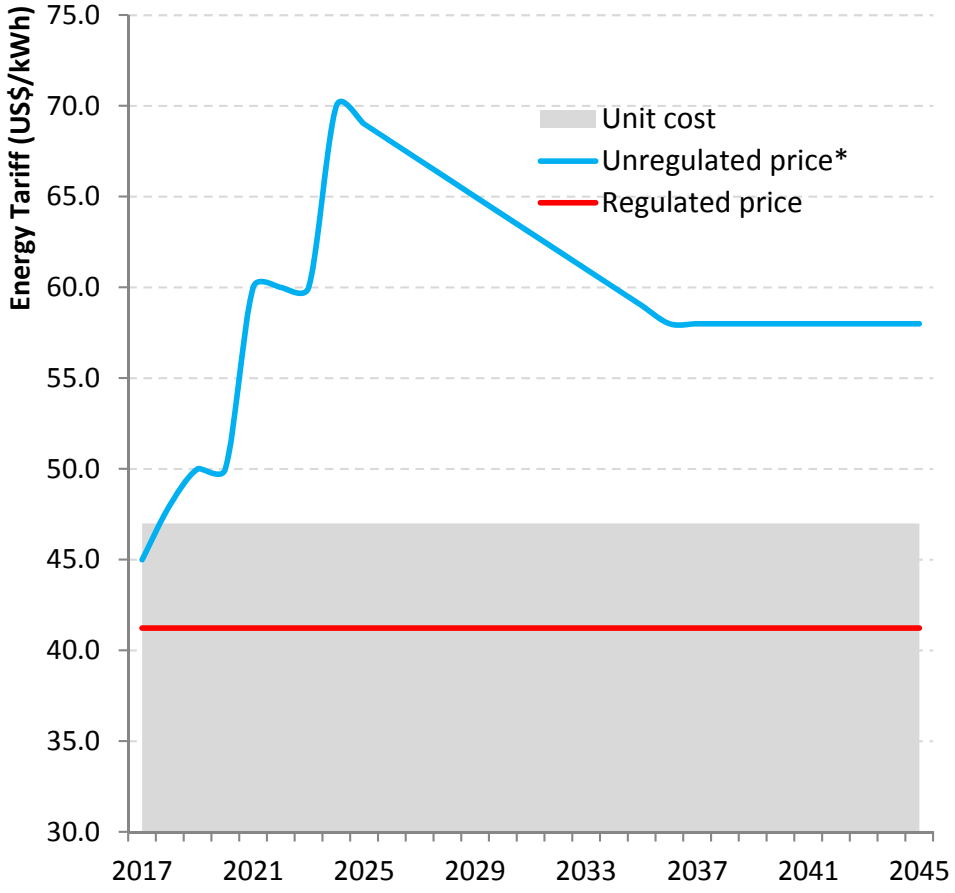
- Another major concern regarding environmental issues is water resource and its sufficiency. UB PP#5 is expected to use 8.1 Mtpa of water. But the water sufficiency around the area considered as a limited and highly criticized by the public. The environmental impact assessment is under way.

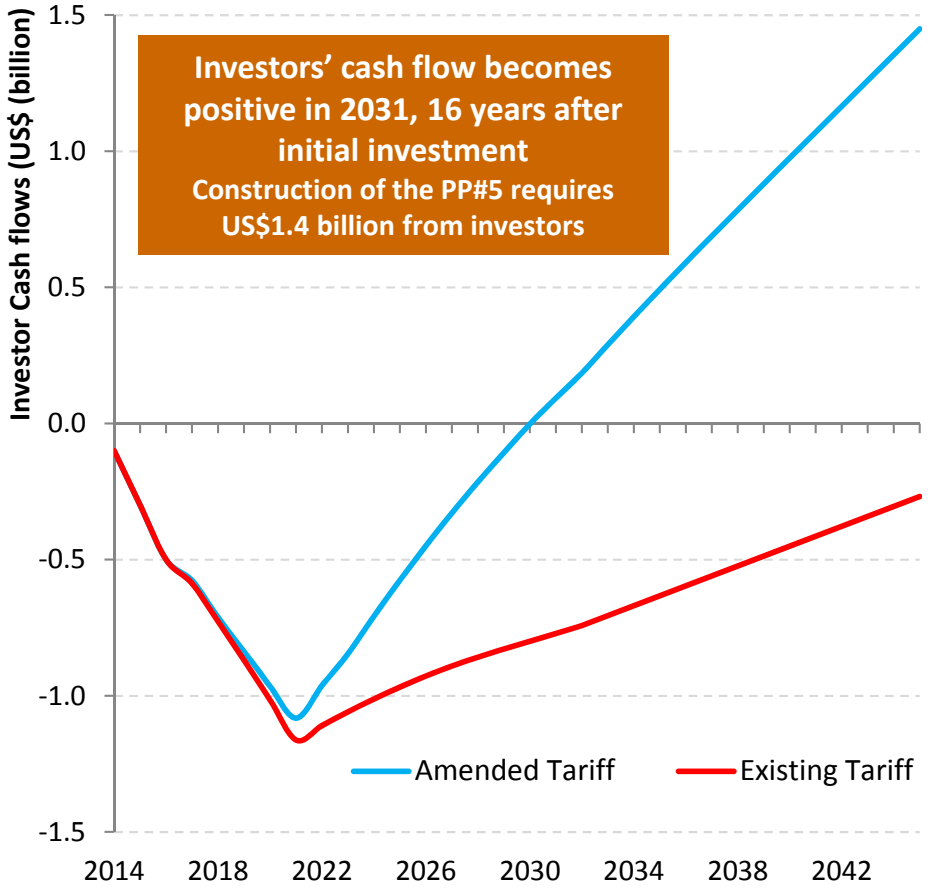
Tariffs & Prices

- Power prices are fully regulated by the GoM and set at a low level where power plants are not able to **operate** profitably. But the private sector is not willing to take all the risks without guarantee on energy demands and reasonable tariffs for electricity and heat. **The current proposal from the investors includes increasing current power prices by at least 20-30% which is not accepted by the GoM**

A profitable tariff system in the power sector is required to prevent UB from pending power shortage by incentivizing private investment in the sector

Sensitivity analysis of cash flow to investors of UB PP#5 in different tariffs





An introducing new tariff system is putting the GoM in dilemma of making politically unfavourable decision to increase power prices which can further push up the price of goods significantly

Source: Feasibility study by ADB

The analysis has considered two different scenarios in order to estimate the economic impact of UB PP#5

Assumptions used in these two scenarios

Base Case:
No UB PP#5
(hypothetical)

- **No replacement capacity in UB**: Assumed future demand and supply gap will be filled by power import from Russia to UB. High power cost will burden the businesses
- **Tariff issue is resolved to enable new power generation needed for non UB demand:** This will enable building of power plants such as Chandgana (600MW), Baganuur (270MW), Egiin Gol (211MW), Tsaidam Nuur (211MW)
- A new power plant with a 34% state ownership will supply 450MW electricity to both OT and TT starting from 2017 substituting electricity imports from China

Policy Case:
With UB PP#5

- **Total investment** required to build UB PP#5 is **US$1.4 billion^.** ~50% of the total investment will remain in the country as domestic procurement, taxes and salaries
- UB PP#5 will start operation with capacity of **450 MW in 2018** providing replacement capacity in UB substituting imported power at a cheaper domestic price
- Capacity will be increased to **820 MW** starting from **2022**
- When operating at full capacity, UB PP#5 is expected to create ~**600 permanent jobs**

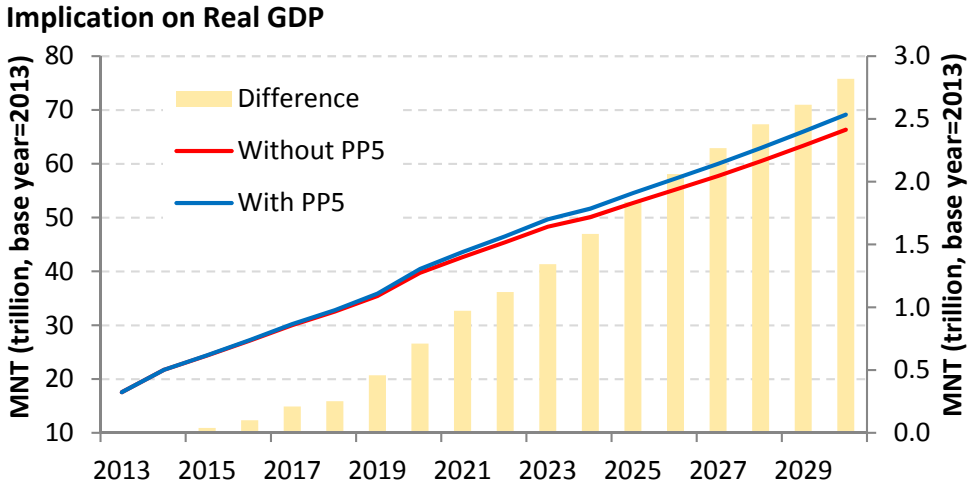
All indicators are in 2013 price. USD/MNT annual exchange rate is 1523

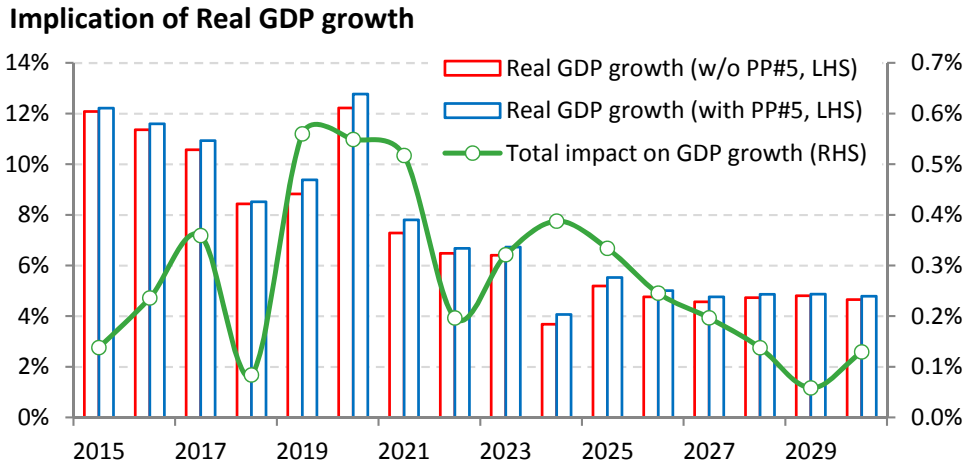
^Will be included in the indirect impact

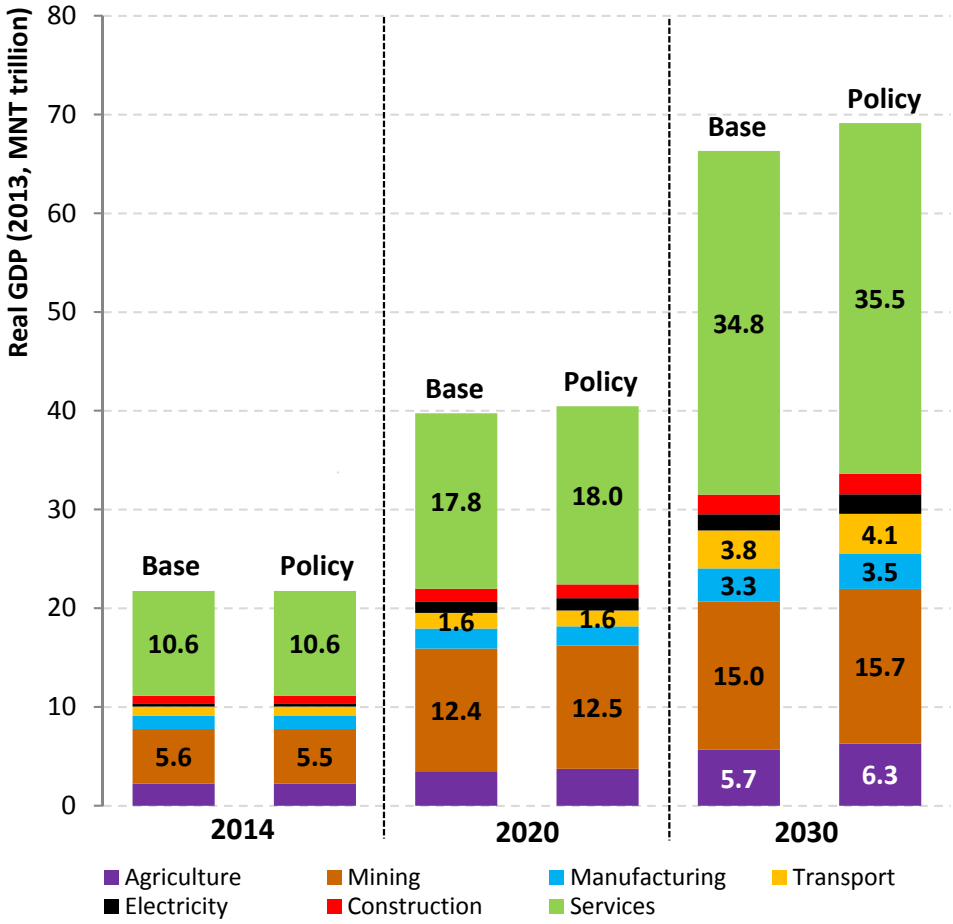
IMPLICATION

Impact on real GDP growth stays at less than 1 percentage point despite having significant amount of investment required

Impact on Real GDP (RGDP)







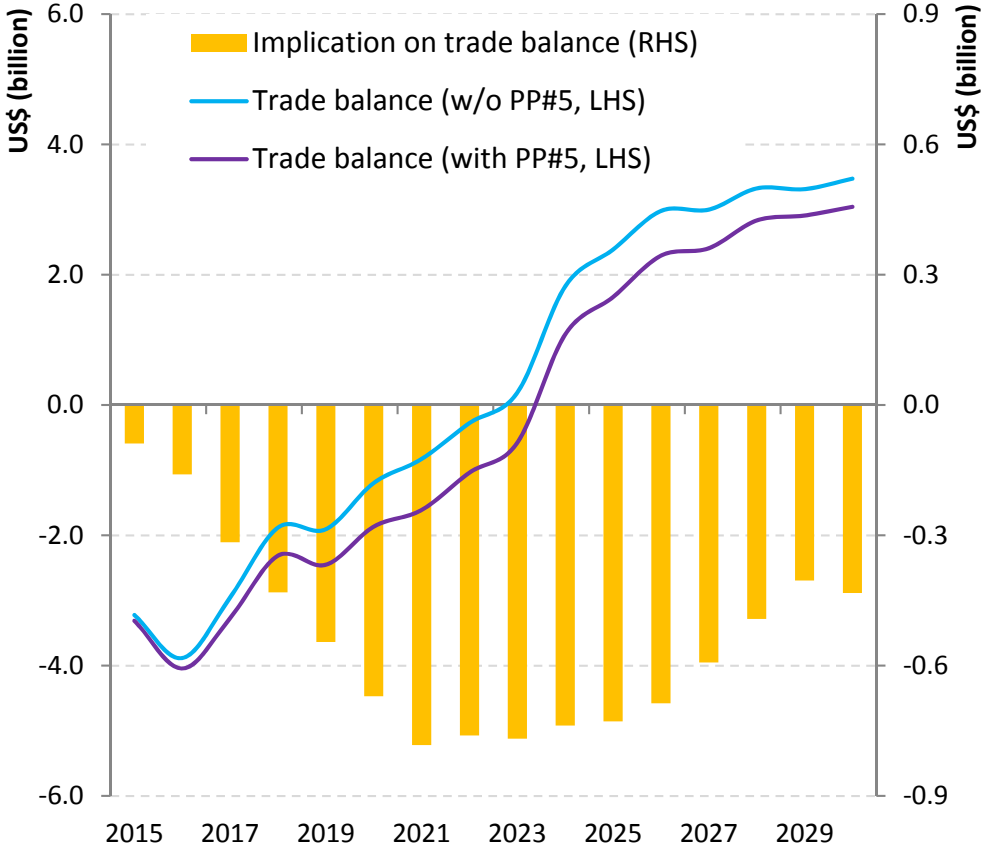
Agriculture and service sectors are effected higher compared to other sectors due to necessity of power consumptions in those sectors

^Benefit is the difference between the UB PP#5 and No UB PP#5, *Construction and service sectors in particular

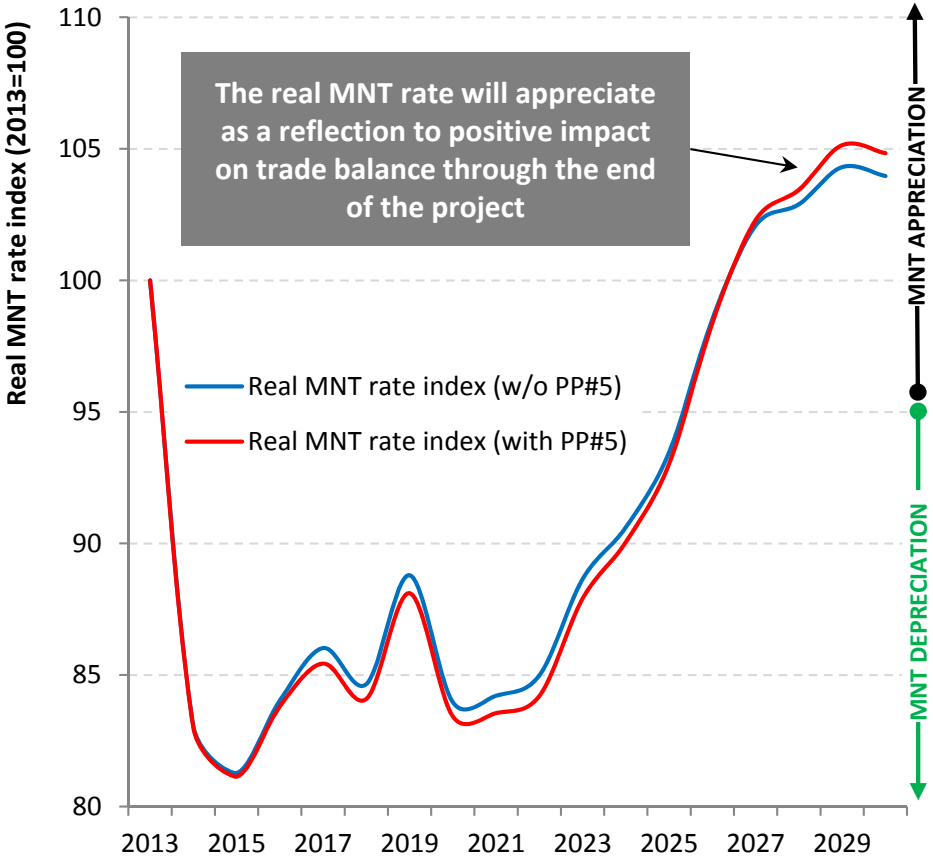
UB PP#5 will rely on imports during construction that will result in a minor depreciation of MNT

Impact on foreign trade and exchange rate

Implication on foreign trade balance



Implication on real MNT exchange rate

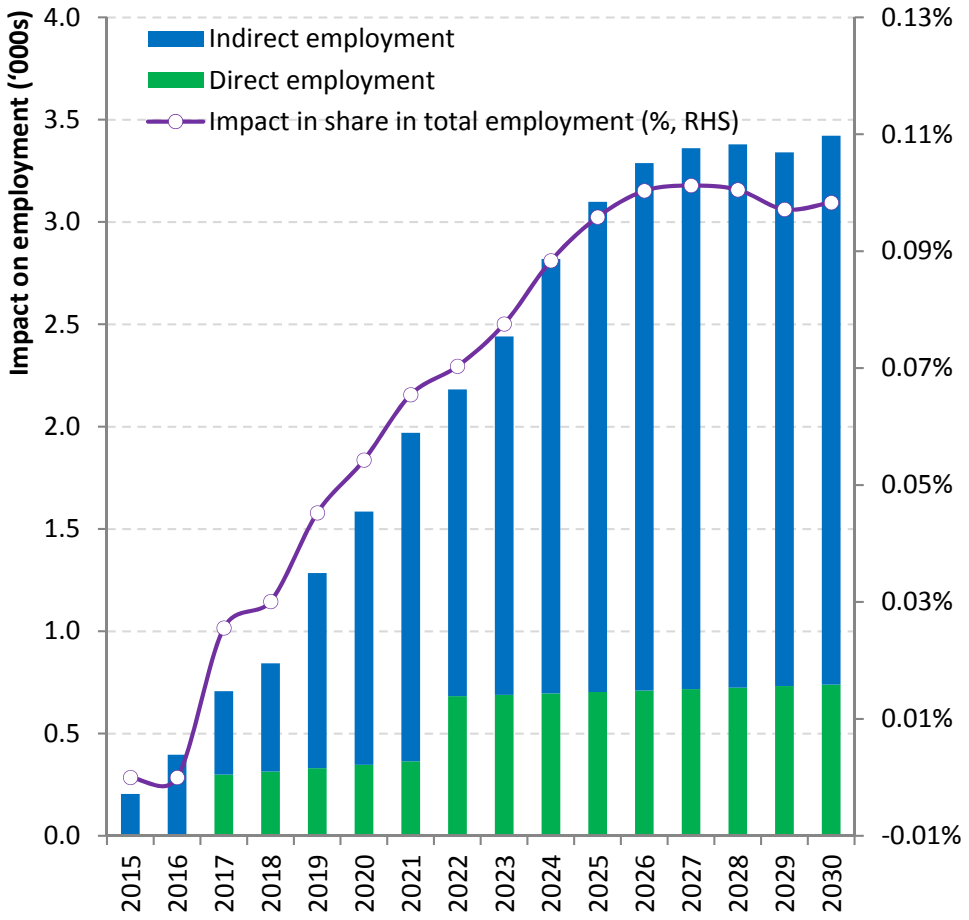


Unless CES is connected to the Southern Electricity system (SES) where the main mining projects are located, UB PP#5 will have NO IMPACT ON EXPORTS

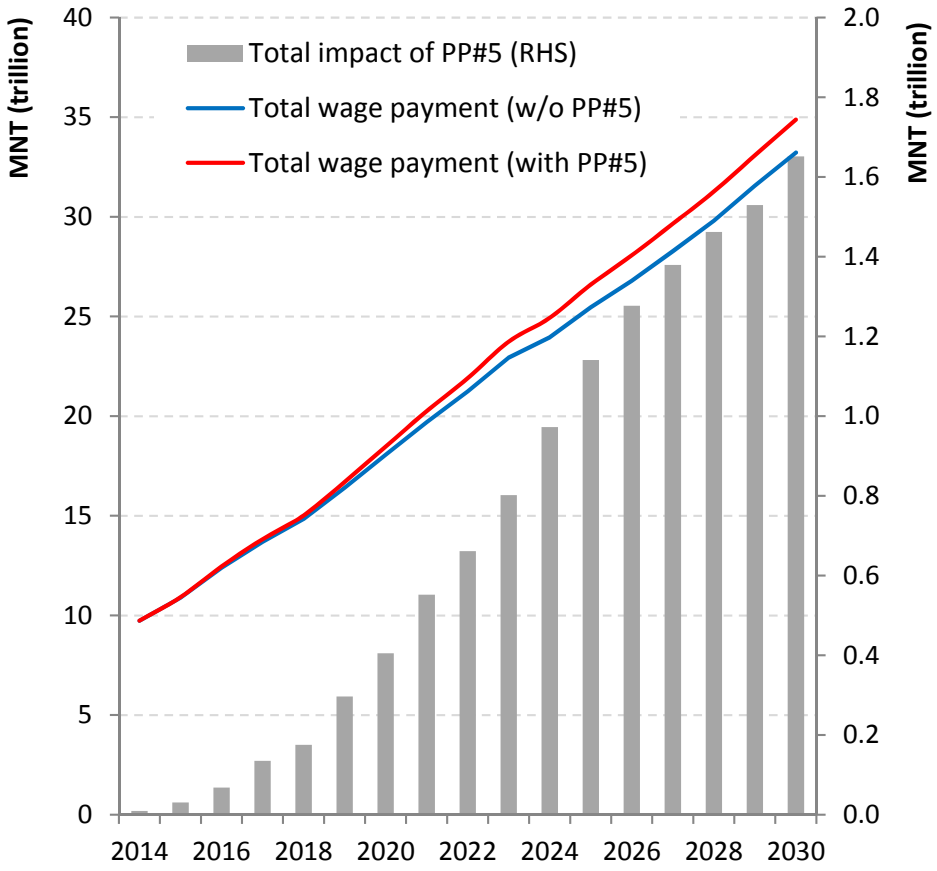
^Benefit is the difference between the UB PP#5 and No UB PP#5

Due to UB PP#5's high impact on labor intensive sectors including agriculture and services, indirect impact will exceed direct impact

Impact on employment and wage



Implication on total wage payment

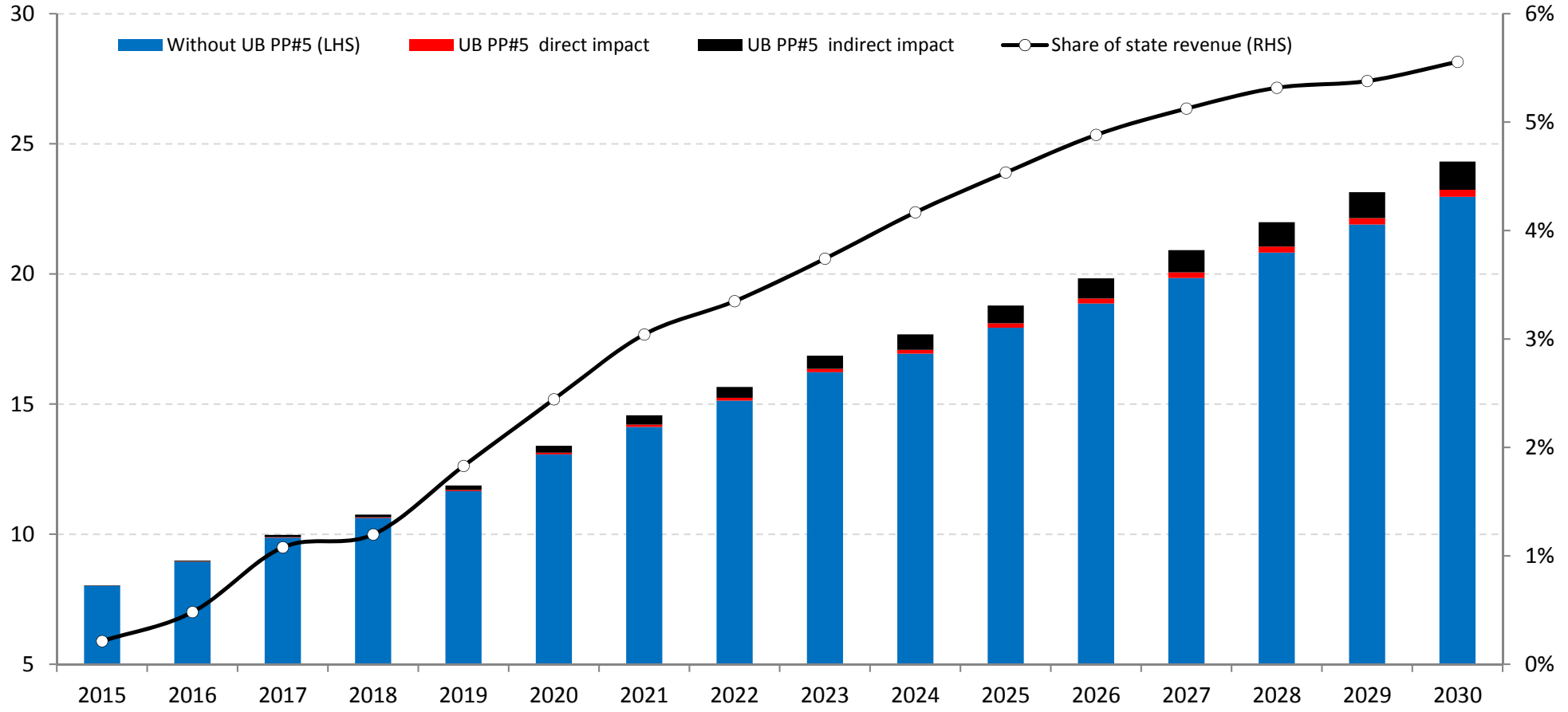


During the PP#5's operation in full capacity, almost 600 of permanent workplaces are expected to be created while other old aged power plant's employees can be potential replacement^

^ But we can't estimate number of workers who shifts to PP#5 from other power plants with the current capacity of CGE Mongolia model

As having high multiplier impact, implication on budget revenue of UB PP#5 is led by indirect impacts

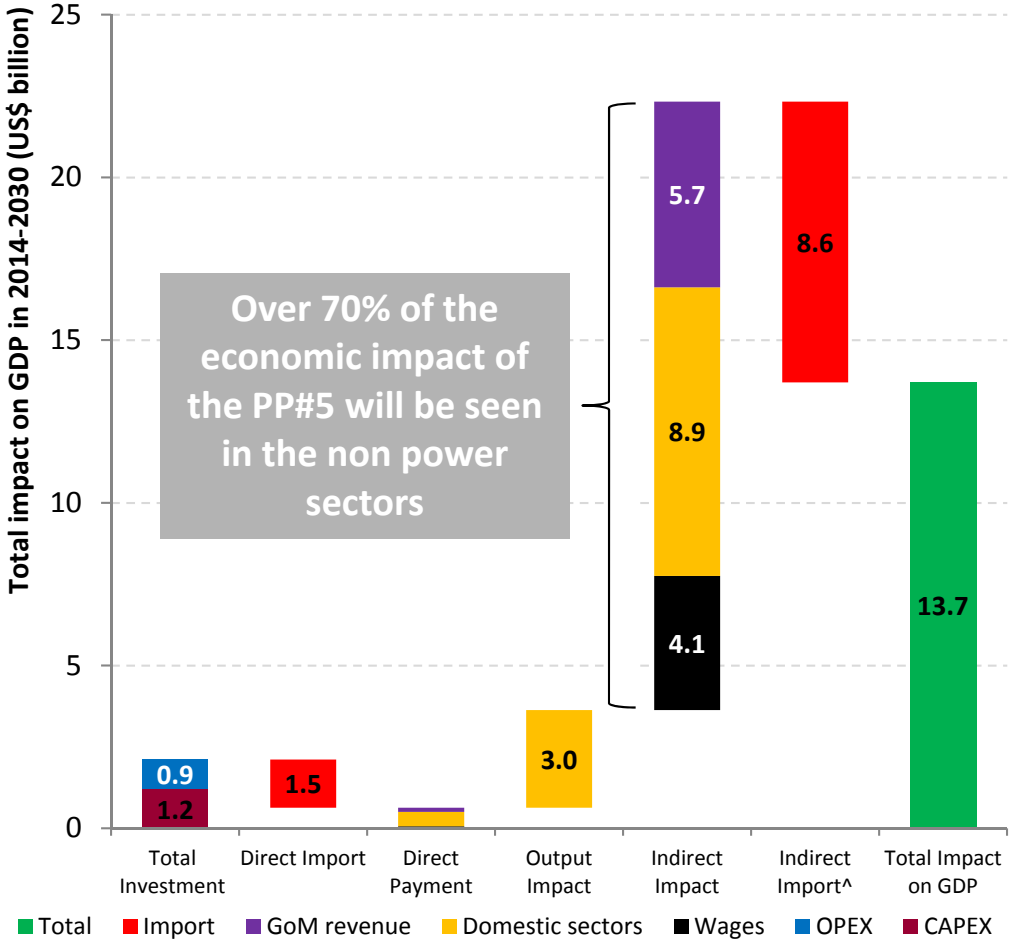
Budget revenue (MNT trillion, base year 2013)



Having no subsidy to power plants will release some burden from the budget while, budget revenue impact peaks at 6% of total budget revenue

Economic impact of the project is limited as minor impacts on GDP and budget revenue mainly during the construction period of the project

Economic implication summary (2013 terms)



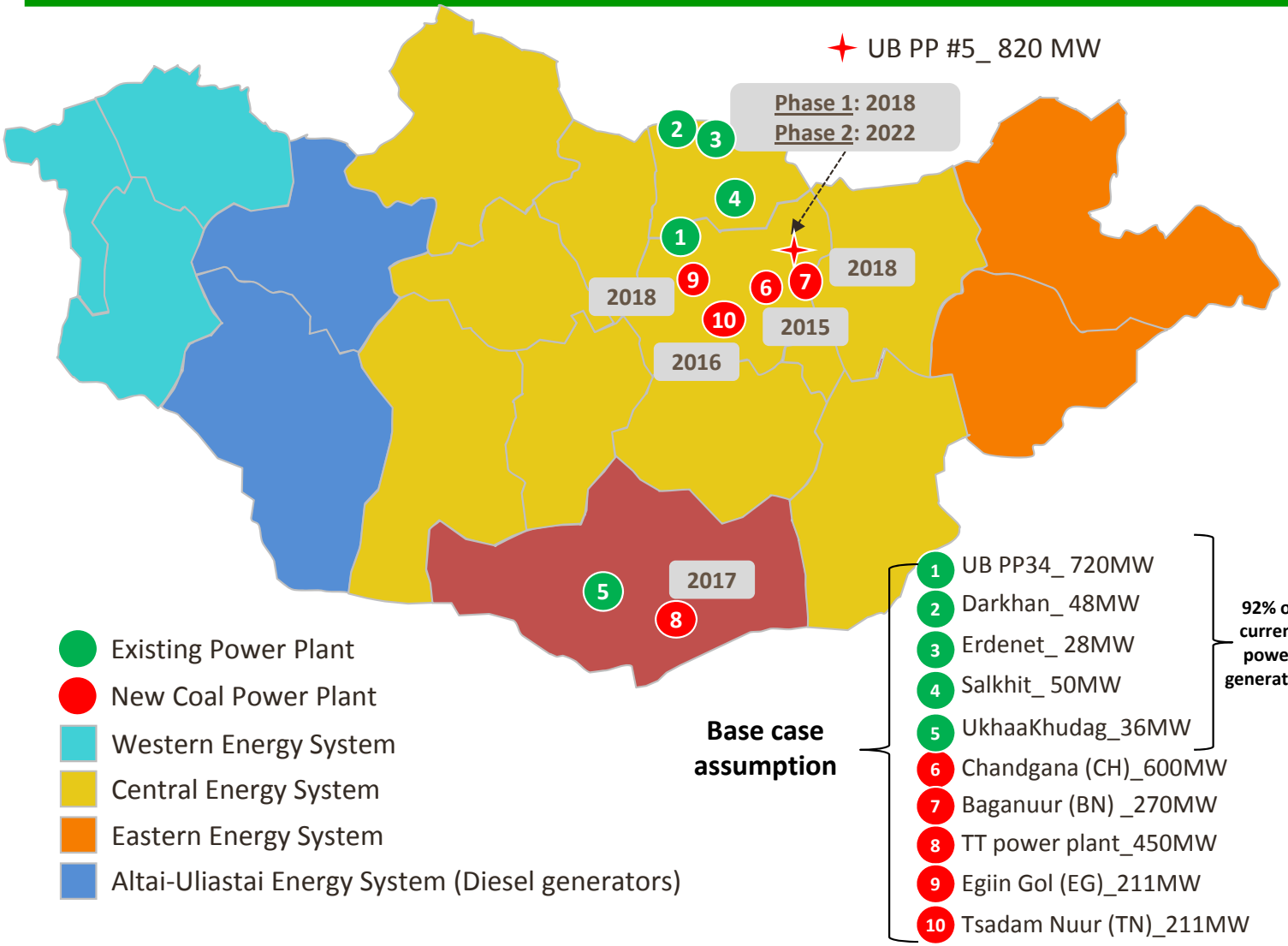
MNT trillion (2013 terms) Economic Impact we expect:	Now: 2013	By 2030	
		Base Case: No PP#5	Policy Case : With PP#5
Real GDP	17.5	66.3	69.1
Private Consumption	8.0	27.4	28.5
Government consumption	2.9	9.1	9.4
Investment	8.7	24.1	26.3
Export	4.3	25.2	25.8
Import	6.4	18.9	20.9
Total wage payment	8.2	33.2	34.9
Budget Revenue	5.9	23.0	24.3

The multiplier impact of PP#5 project is estimated to be high at 3.04 due to unsatisfied demand of power beyond the PP#5, therefore, economies of scale remains high in the power sector after PP#5

APPENDIX

Under the non regulated price, UB PP#5 will provide replacement capacity in UB and substitute expensive power import

Assumptions (National level)



Base case assumption

1. UB PP34_ 720MW
2. Darkhan_ 48MW
3. Erdenet_ 28MW
4. Salkhit_ 50MW
5. UkhaaKhudag_36MW
6. Chandgana (CH)_600MW
7. Baganuur (BN) _270MW
8. TT power plant_450MW
9. Egiin Gol (EG)_211MW
10. Tsadam Nuur (TN)_211MW

92% of current power generation