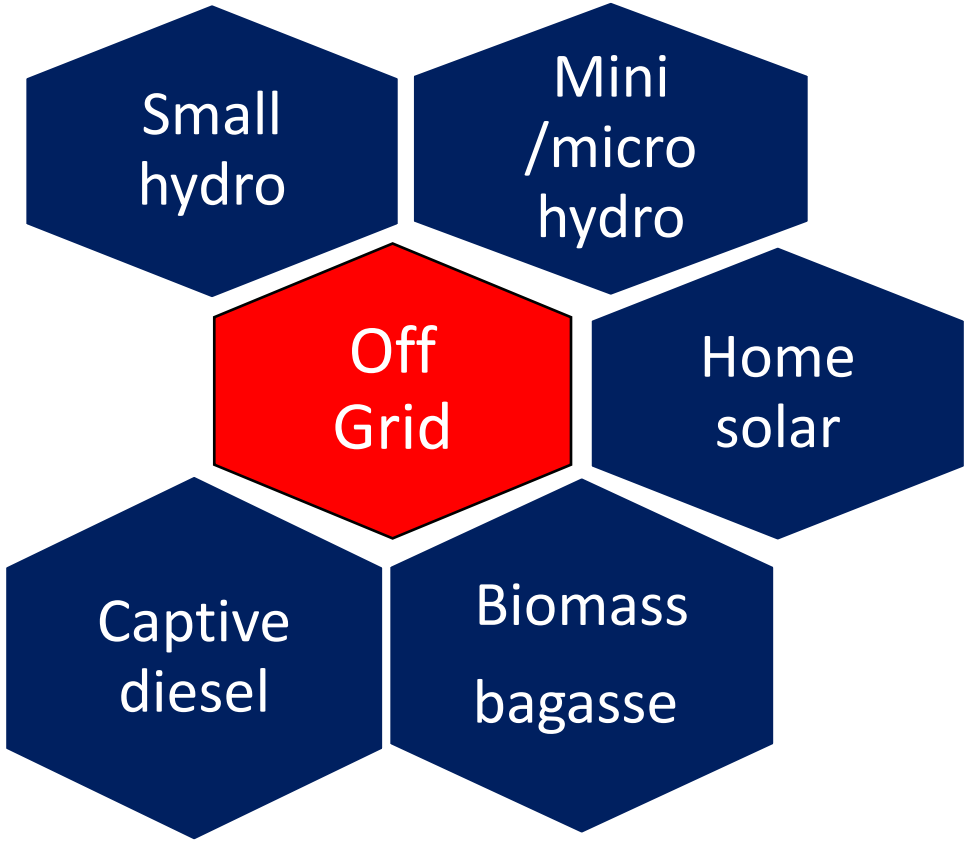
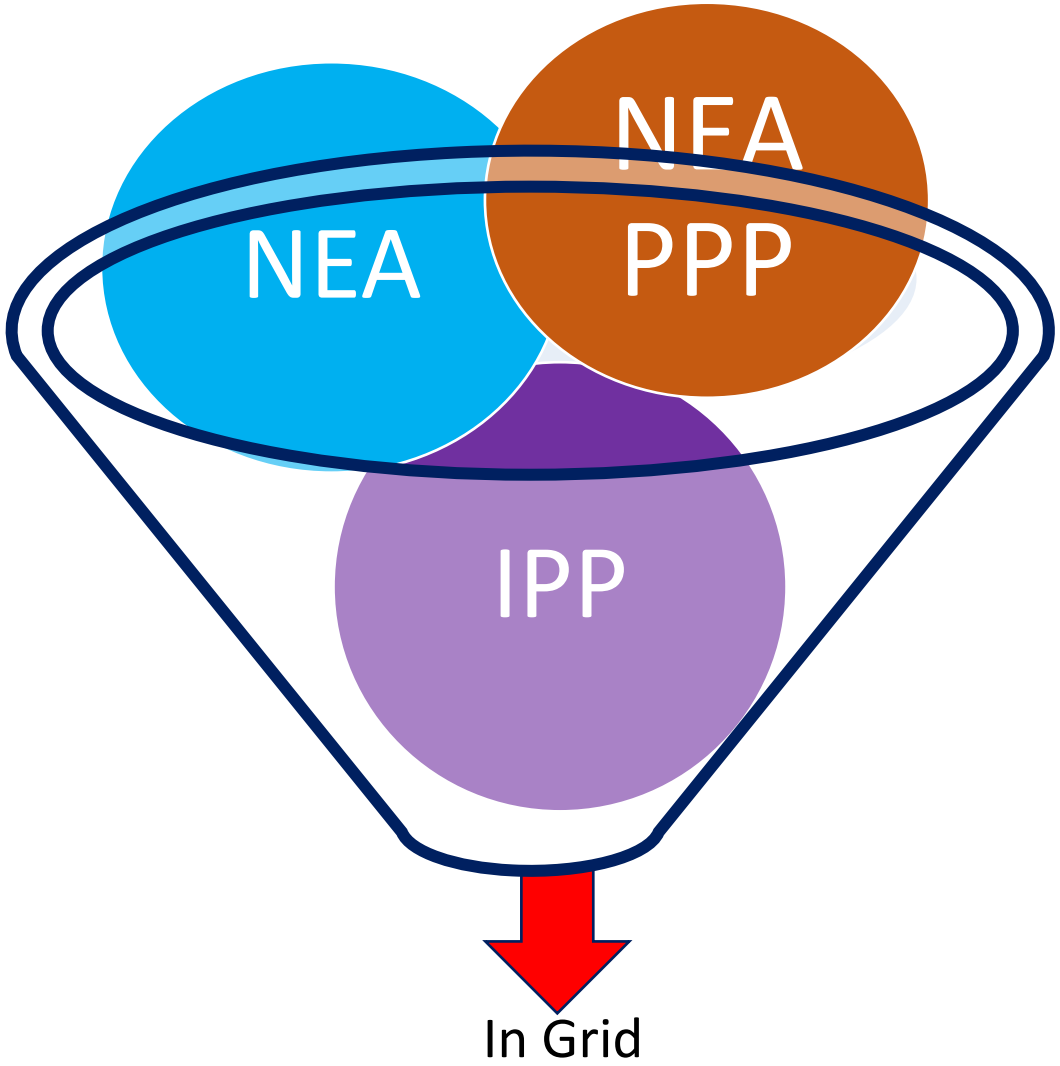
UNDERCONSTRUCTION GENERATION PROJECTS OF NEPAL ELECTRICITY AUTHORITY

GENERATION DEVELOPMENT IN NEPAL





NEA INVOLVED UNDER CONSTRUCTION PROJECTS

CATEGORY	PROJECT NAME	CAPACITY	TYPE	EXPECTED COMMISSIONING
NEA OWN	Chameliya	30 MW	PROR	2016/17 end
	Kulekhani 3	14 MW	Storage (cascade)	2016/17 end
	Upper Trishuli 3A	60 MW	ROR	2017/18
	Rahughat	40 MW	ROR	2019/20
NEA PPP (Subsidiary/ Associate companies)	Upper Tamakoshi	456 MW	PROR	2018/19
	Middle Bhotekosi	102 MW	ROR	2018/19
	Rsuwagadhi	111 MW	ROR	2018/19
	Upper Sanjen	14.8 MW	ROR	2016/17 end
	Sanjen	42 MW	ROR	2017/18 end
	Trisuli 3 B	37 MW	ROR (cascade)	2018/19
	Tanahu Hydro	140 MW	Storage	2020/21
	Total	**1046.80 MW**		

CHAMELIYA

- Completed above 95%.
- Faced various geological problems resulting in time and cost over run.
  - Hard rock in dam foundation not as expected.
  - After excavation of complete 4.6 km tunnel, 843 m got squeezed.
  - Mud flow from nearby rivulet Bhelgad entered the tunnel.
  - Original location of Power house foundation was in alluvium so shifted back by huge back slope cutting and its stabilization.
  - Cavities encountered on the sides of vertical shaft.
- Chameliya can be taken as unique example of geological problems.

TUNNEL SQUEEZING

MUD FLOW AFTER SQUEEZING

TREATMENT OF SQUEEZED TUNNEL

PREPARING FOR TREATMENT

BREAKING BY MACHINE

BREAKING MANUALLY

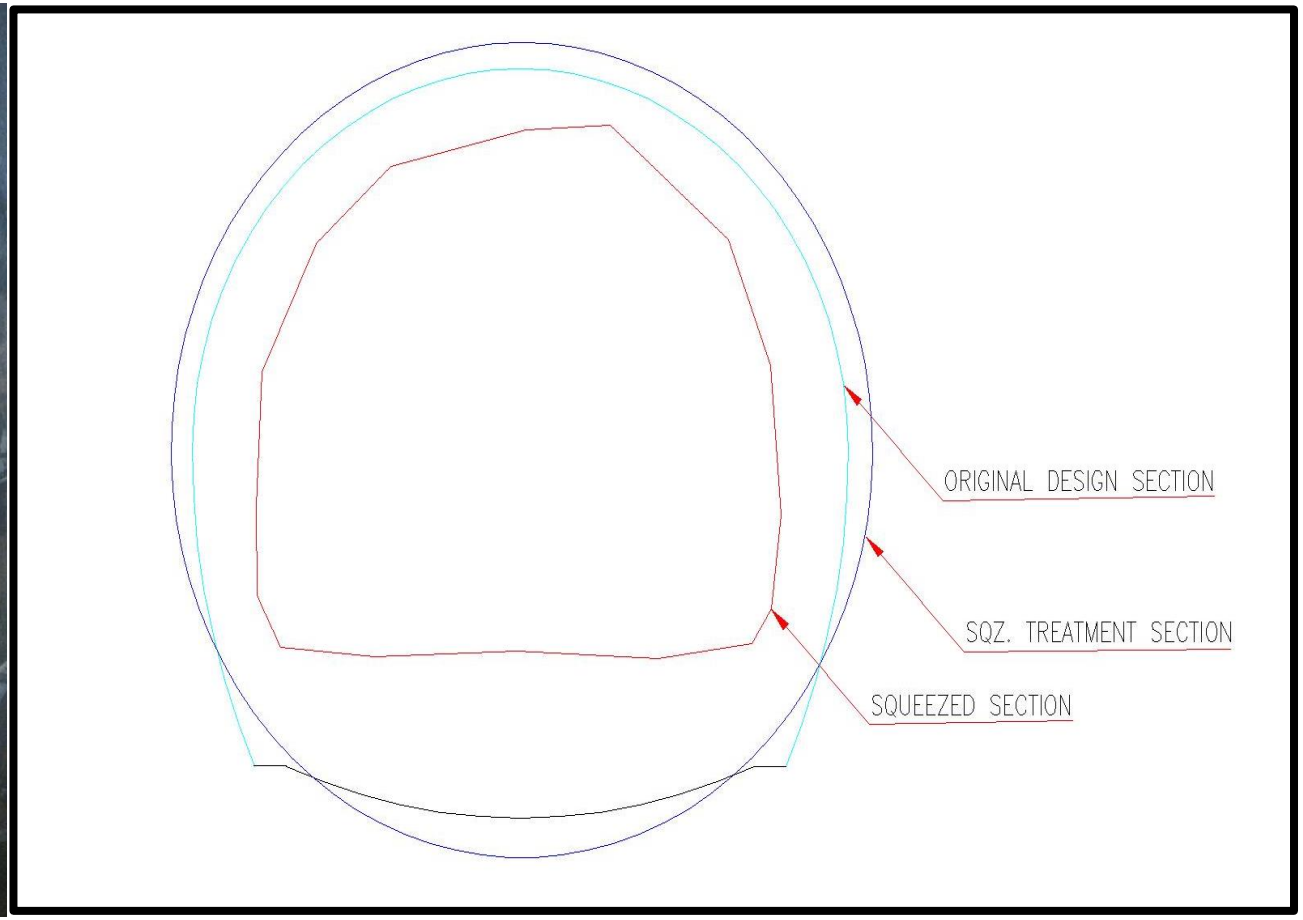
TREATMENT OF SQUEEZED TUNNEL

NEW STEEL RIB INSTALLATION

NEW STEEL BAR INSTALLATION

SHORTCRETING

TREATMENT OF SQUEEZED TUNNEL



FINAL SECTION

OTHER PROBLEMS IN TUNNELING

Debris Flow

Rock fall

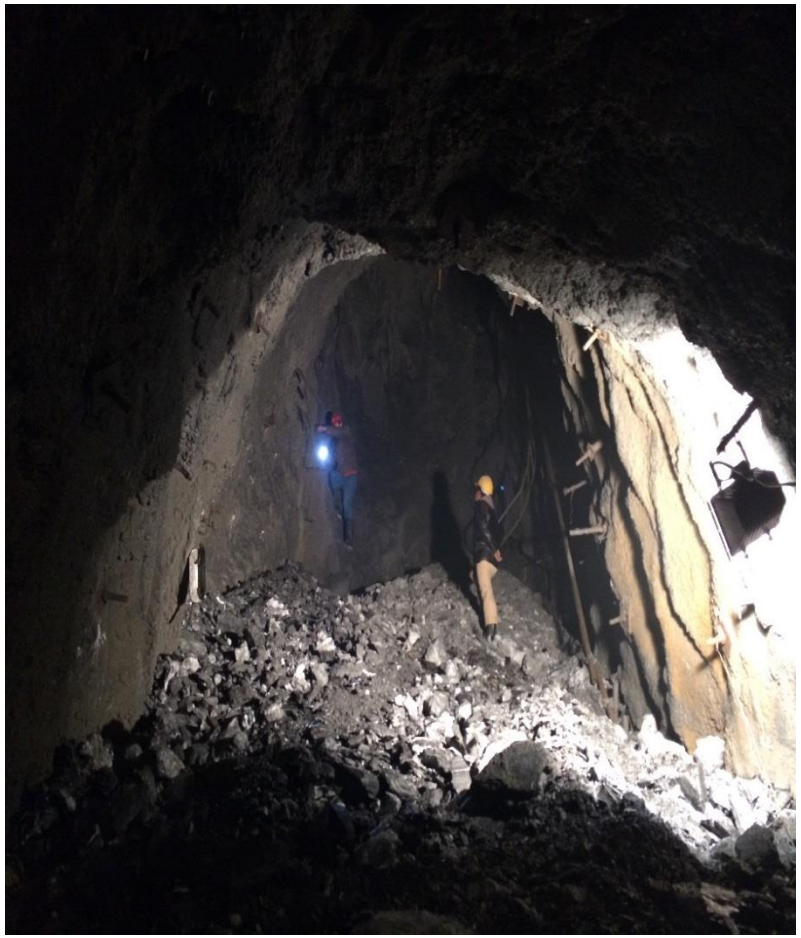
VERTICAL SHAFT

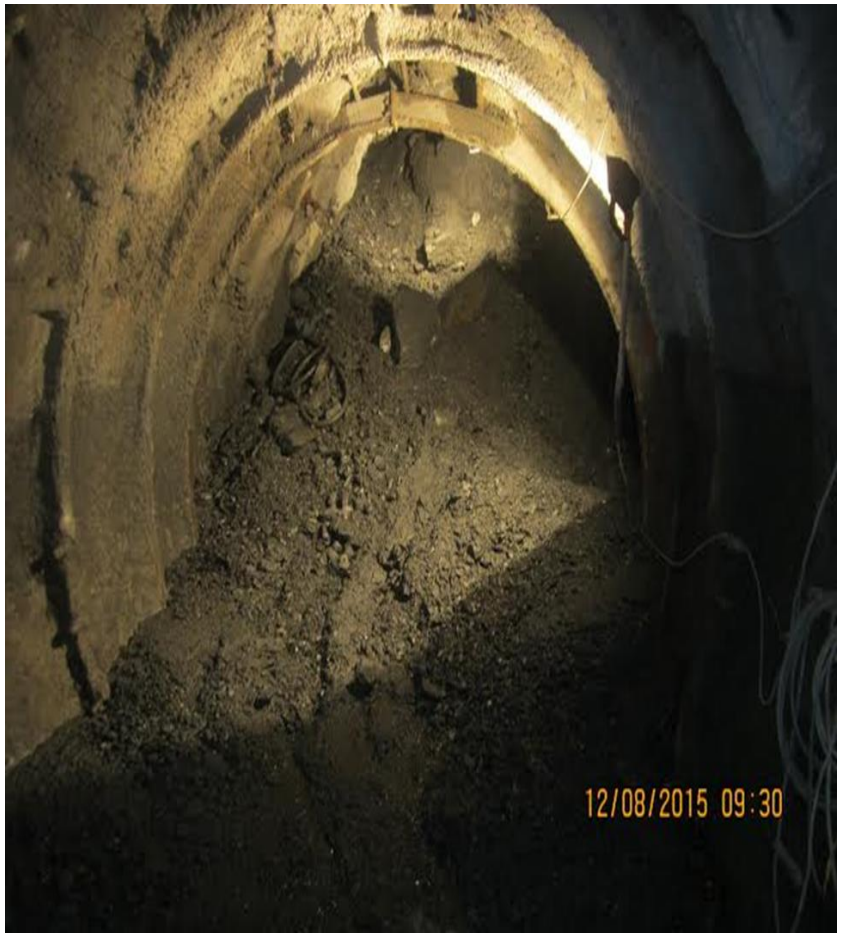
- Large cavity around shaft
  - Approx. 25 x 8 x 5 m
  - Crushed material

POWER HOUSE SHIFTING AND BACK SLOPE PROTECTION

KULEKHANI 3

- Completed above 90%.
- This project also suffered time and cost over run owing to:
  - Collapse of Inclined Shaft
  - Power house foundation
  - Performance of E/M, H/M Contractor
- It is expected to be commissioned by the end of f/y 2016/17.




12/08/2015 09:30


12/08/2015 09:07


07/06/2014 14:29

UPPER TRISHULI 3A

- Above 45% work is completed and would have been commissioned by now.
- Unfortunately, this project was hard hit by earth quake. As an impact of earth quake:
  - The access road to head works got completely damaged by making the head works area inaccessible for about a year after EQ. Access road to surge tank also got damaged.
  - A huge land slide got triggered up hill on the left bank of the river at head works causing a potential danger to stability of head works.
  - Similarly a huge land slide triggered uphill near the tunnel inlet portal on the right bank near the head works causing threat to stability of inlet structures including the desanding basin.
  - Most of the construction equipment and the construction material got damaged.
  - Work is not resumed till date along with the contractual complications of EPC Contract in such events.



RAHUGHAT

- Civil contract terminated due to poor performance of the contractor.
- Now fresh invitation of bids published for civil and hydro-mechanical as single EPC Contract.
- Due to financing from Indian Exim Bank, it will be limited bidding.
- Experience of previous contract used in new design.
  - Almost full tunnel is lined now.
  - Surge shaft is on surface now.
  - Capacity has been upgraded to 40 MW.
  - Transmission line is deleted.
- Total progress till the termination of civil contract was 13%

LESSONS LEARNT

THE STUDY	• ***Geology, unlike Physics, is not exact Science.*** • ***Since a 100% geological exploration during study is not possible, it is a Science of assumptions, probabilities and estimations.*** • ***However, a credible and dependable study minimizes the geological surprises. It saves cost and time over run to a large extent.*** • ***Even if it is early stage of the project, highest importance should be given to a detailed and credible study.***
STRUCTURE	• ***Underground structures are safer in the event of an earthquake. Otherwise it is better to semi cover few of the structures.***
DOCUMENT	• ***Even if it is same FIDIC Document, every contract is unique in nature and quite new contractual issues may be encountered.***

THANKS