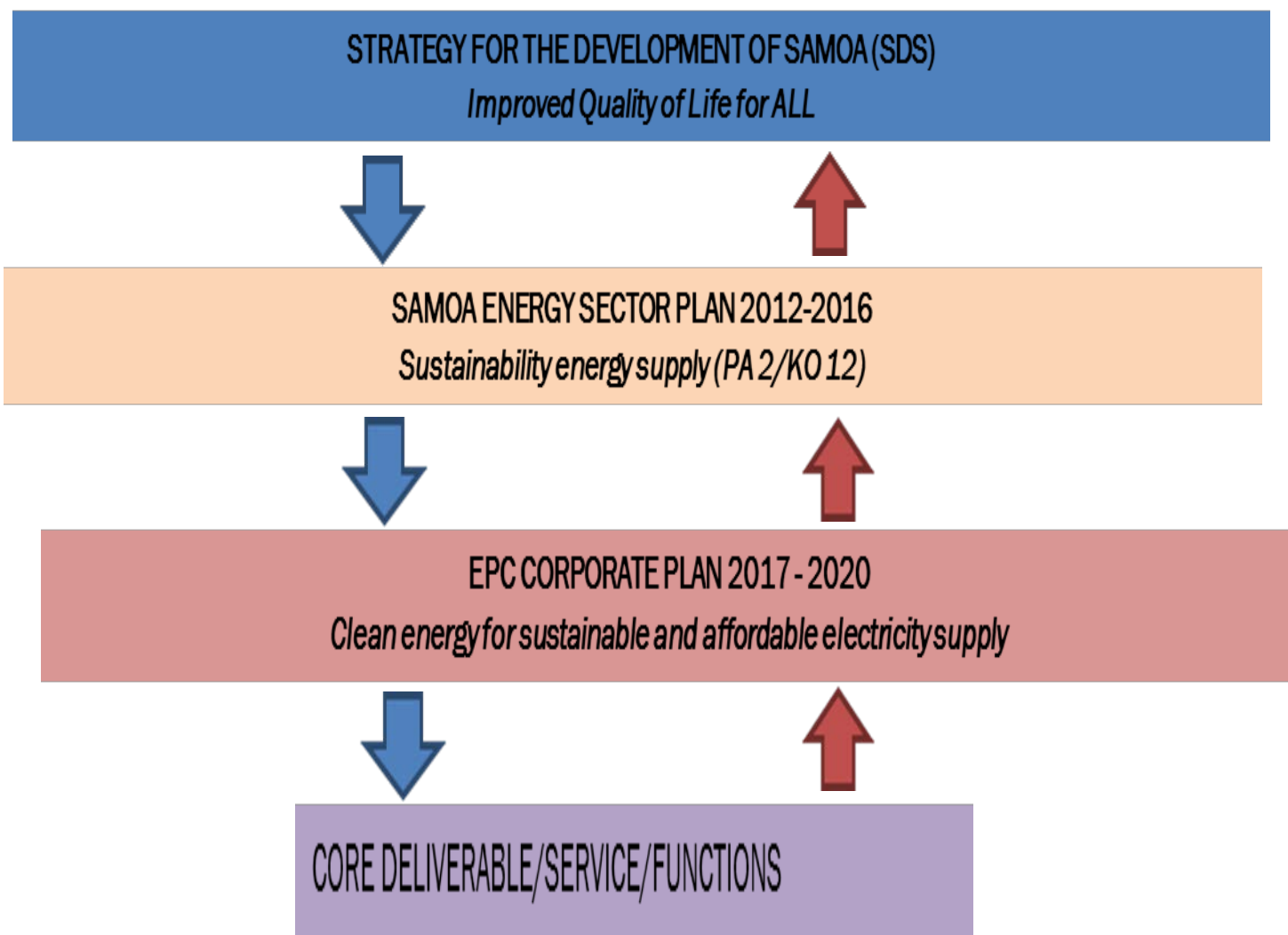




EPC INFRASTRUCTURE

CASE STUDY

CORPORATE PLAN



ENERGY AND CAPACITY MIX FORECAST OF UPOLU

Upolu System Energy Mix Forecast															
Row	Yr No		0	1	2	3	4	5	6	7	8	9	10	11	12
1	Year		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2	gWh load growth, %pa			0.44%	19.75%	5.22%	7.58%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
3	Total Gross Generation, gWH	Type	103.918	104.371	124.986	131.510	141.478	145.723	150.094	154.597	159.235	164.012	168.933	174.001	179.221
4	Existing Hydro	Hydro	36.774	35.745	29.989	30.897	34.029	47.567	47.567	47.567	47.567	47.567	47.567	47.567	47.567
5	Diesel Generation required, gWH	Diesel	67.143	68.62331	83.14695	84.77	96.14646	75.92101	-168.263	-163.76	-159.122	-154.345	-149.425	-144.357	-139.137
6	Existing Diesel Generation available, gWH	Diesel	56.4144	106.872	106.872	106.872	106.872	106.872	26.9808	26.9808	26.9808	26.9808	26.9808	26.9808	26.9808
7	Total New Hydro Generation	Hydro	0	0	0	0	0	0	3.659888	3.659888	3.659888	3.659888	3.659888	3.659888	3.659888
8	Total New Solar Generation	Solar	0	0	0.316	3.182	11.03	21.962	24.386	24.386	24.386	24.386	24.386	24.386	24.386
9	Total Other New RE Generation	Wind/Biomass	0	0	0	0.179	0.273	0.273	242.745	242.745	242.745	242.745	242.745	242.745	242.745
10	TOTAL RE GENERATION		36.774	35.74521	30.30513	34.258	45.332	69.8018	318.3577	318.3577	318.3577	318.3577	318.3577	318.3577	318.3577
11	PERCENTAGE RENEWABLE		35.39%	34.25%	24.25%	26.05%	32.04%	47.90%	212.10%	205.93%	199.93%	194.11%	188.45%	182.96%	177.63%

Upolu System Peak Demand Mix Forecast															
Row	Yr No		0	1	2	3	4	5	6	7	8	9	10	11	12
1	Year		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2	MW Peak Demand growth, %pa			3.00%	3.00%	13.11%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
3	Peak Demand MW	Type	17.500	18.025	18.566	21.000	21.630	22.279	22.947	23.636	24.345	25.075	25.827	26.602	27.400
4	Total Existing Hydro Capacity, MW	Hydro	5	5	5	5	5	5	5.6	5.6	5.6	5.6	5.6	5.6	5.6
5	Diesel Capacity required, MW	Diesel	12.5	13.025	13.19375	13.398	8.78	9.4289	-45.0027	-44.3143	-43.6052	-42.8749	-42.1226	-41.3478	-40.5498
6	Diesel Capacity available, MW	Diesel	16.1	30.5	30.5	30.5	30.5	30.5	7.7	7.7	7.7	7.7	7.7	7.7	7.7
7	Total New Hydro Generation	Hydro	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Total New Solar Generation	Solar	0	0	0.372	2.492	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74	7.74
9	Total Other New RE Generation	Wind/Biomass	0	0	0	0.11	0.11	0.11	54.61	54.61	54.61	54.61	54.61	54.61	54.61
10	TOTAL RE GENERATION		5	5	5.372	7.602	12.85	12.85	67.95	67.95	67.95	67.95	67.95	67.95	67.95
11	PERCENTAGE RENEWABLE		28.57%	27.74%	28.94%	36.20%	59.41%	57.68%	296.11%	287.49%	279.12%	270.99%	263.09%	255.43%	247.99%

ENERGY AND CAPACITY MIX FORECAST FOR SAVAII

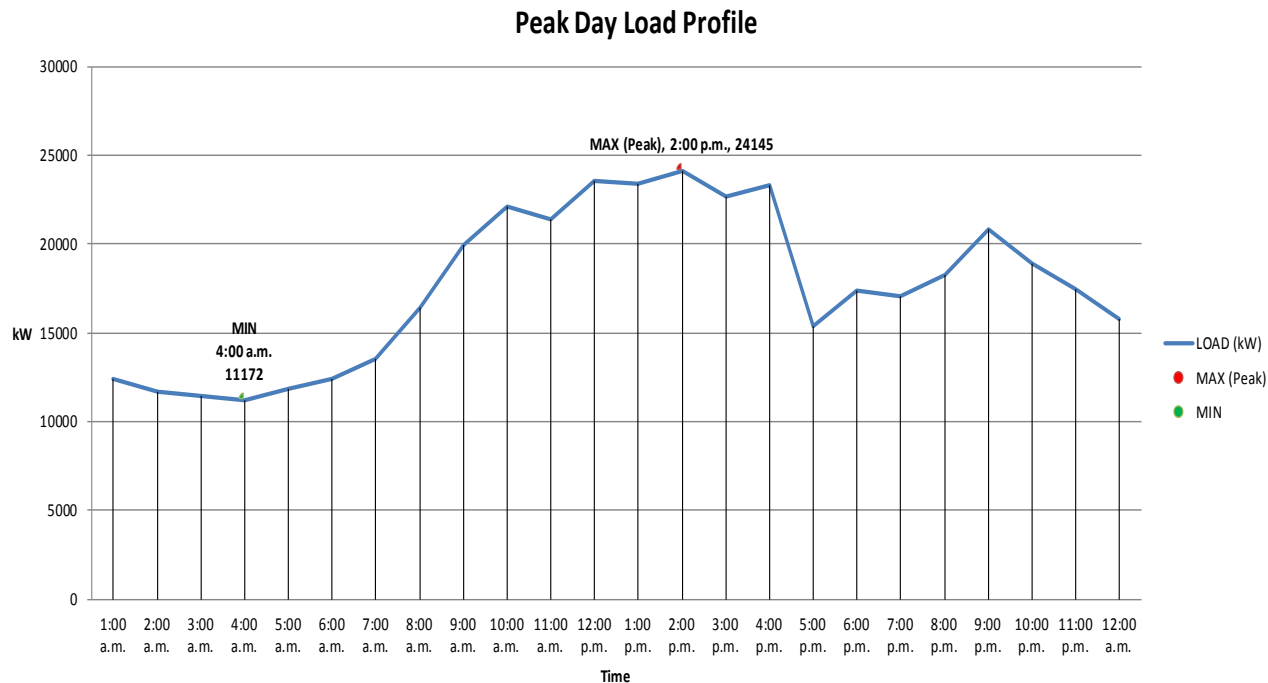
Savaii System Energy Mix Forecast															
Row	Yr No		0	1	2	3	4	5	6	7	8	9	10	11	12
1	Year		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2	gWh load growth, %pa			3.12%	-1.29%	5.55%	8.50%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
3	Total Gross Generation, gWH	Type	11.363	11.718	11.567	12.209	13.247	13.909	14.605	15.335	16.102	16.907	17.752	18.640	19.572
4	Total Existing Hydro Generation, gWH	Hydro	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Diesel Generation required, gWH	Diesel	11.363	11.718	11.567	11.947	12.839	8.16835	-6.74418	-6.01394	-5.24719	-4.4421	-3.59675	-2.70914	-1.77715
6	Existing Diesel Generation available, gWH	Diesel	12.1	12.1	12.1	12.1	14.717	14.717	14.717	14.717	14.717	14.717	14.717	14.717	14.717
7	Total New Hydro Generation	Hydro	0	0	0	0	0	1.353	9.953	9.953	9.953	9.953	9.953	9.953	9.953
8	Total New Solar Generation	Solar	0	0	0	0.262	0.416	4.388	4.388	4.388	4.388	4.388	4.388	4.388	4.388
9	Total Other New RE Generation	Wind/Solar/	0	0	0	0	0	0	7.008	7.008	7.008	7.008	7.008	7.008	7.008
10	TOTAL RE GENERATION		0.000	0.000	0.000	0.262	0.416	4.388	21.349	21.349	21.349	21.349	21.349	21.349	21.349
11	PERCENTAGE RENEWABLE		0.00%	0.00%	0.00%	2.15%	3.14%	31.55%	146.18%	139.22%	132.59%	126.27%	120.26%	114.53%	109.08%

Savaii System Peak Demand Mix Forecast															
Row	Yr No		0	1	2	3	4	5	6	7	8	9	10	11	12
1	Year		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2	kW Peak Demand growth, %pa			0.02	0.058824	0.037037	0.071429	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
3	Total Gross Peak Demand growth, kW	Type	2500	2550	2700	2800	3000	3150	3307.5	3472.875	3646.519	3828.845	4020.287	4221.301	4432.366
4	Total Existing Hydro Capacity, kW	Hydro	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Diesel Capacity required, kW	Diesel	2500	2550	2700	2800	3000	3150	3307.5	3472.875	3646.519	3828.845	4020.287	4221.301	4432.366
6	Existing Diesel Capacity available, kW	Diesel	3000	3000	3000	3000	4200	4200	4200	4200	4200	4200	4200	4200	4200
7	Total New Hydro Generation	Hydro	0	0	0	0	0	0	1908.6	1908.6	1908.6	1908.6	1908.6	1908.6	1908.6
8	Total New Solar Generation	Solar	0	0	150	450	450	450	1650	1650	1650	1650	1650	1650	1650
9	Total Other New RE Generation	Wind/Solar/	0	0	0	0	0	0	1200	1200	1200	1200	1200	1200	1200
10	TOTAL RE GENERATION		0.000	0.000	150.000	450.000	450.000	450.000	4,758.600	4,758.600	4,758.600	4,758.600	4,758.600	4,758.600	4,758.600
11	PERCENTAGE RENEWABLE		0.00%	0.00%	5.56%	16.07%	15.00%	14.29%	143.87%	137.02%	130.50%	124.28%	118.36%	112.73%	107.36%

UPOLU TYPICAL LOAD CURVE

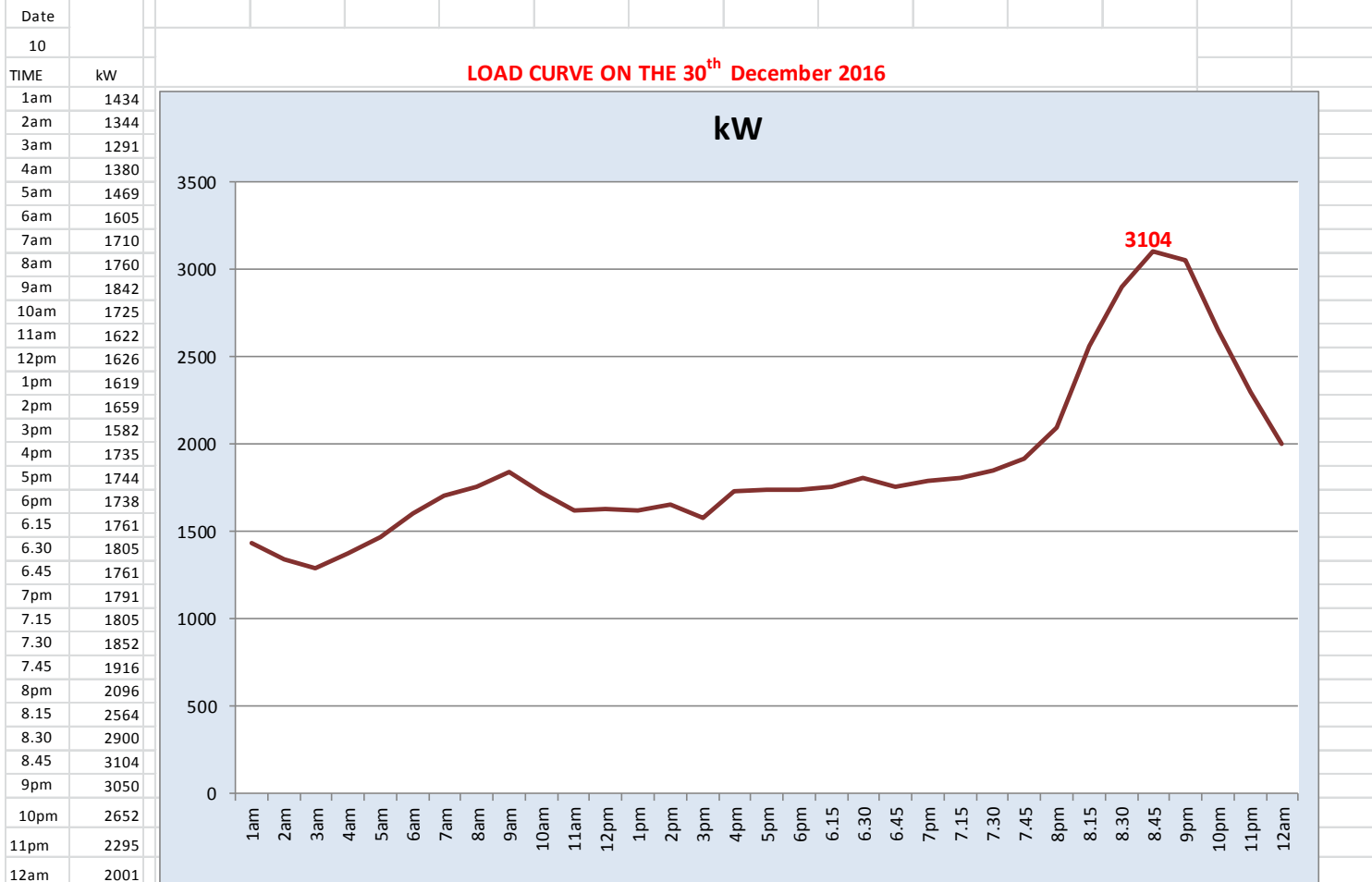
MAX (Peak) is: 24145 kW @ 2:00 p.m.
MIN is: 11172 kW @ 4:00 a.m.

Hour	LOAD (kW)
1:00 a.m.	12416
2:00 a.m.	11676
3:00 a.m.	11473
4:00 a.m.	11172
5:00 a.m.	11820
6:00 a.m.	12377
7:00 a.m.	13503
8:00 a.m.	16382
9:00 a.m.	19975
10:00 a.m.	22122
11:00 a.m.	21411
12:00 p.m.	23514
1:00 p.m.	23369
2:00 p.m.	24145
3:00 p.m.	22702
4:00 p.m.	23280
5:00 p.m.	15328
6:00 p.m.	17367
7:00 p.m.	17012
8:00 p.m.	18234
9:00 p.m.	20836
10:00 p.m.	18884
11:00 p.m.	17426
12:00 a.m.	15759



SAVAII TYPICAL LOAD CURVE

LOAD PROFILE FOR PEAK DAY



PSEP PROJECT

❑ PSEP Original Investment Plan

- 4 generation subprojects
- 11 transmission and distribution subprojects
- Single and 3 phase prepayment meters
- SCADA
- Portable equipment for measuring voltage and stream flow

❑ PSEP actual projects achieved

- 11 generation subprojects
- 25 transmission and distribution subprojects
- Single and 3 phase prepayment meters
- SCADA
- Portable equipment for measuring voltage and stream flow



RENEWABLE AND REHAB PROJECT

- Tafitoala – 460KW
- Faleseela – 190KW
- Vailoa Palauli – 1,000KW
- Fuluasou – 680KW
- Tiapapata – 480KW
- Samasoni Rehab – 1,800KW
- Fale o le Fee Rehab – 1,650 KW
- Alaoa main intake and head race rehab - 1, 000KW



IPP PROJECTS

❑ Solar Projects

- Solar for Samoa – 4MW
- Green Power – 4MW
- Sun Pacific – 2MW
- Louis Berger – 2MW

❑ Wind and Water Storage Project

- Pacific E Power – 24MW wind/pump storage at Mt. Lepu'e

❑ Biomass Project

- Biogen3 – 4MW
- Village Life – 4MW
- Tyre Recycle – 4MW



OTHER RENEWABLE ENERGY

- NZMFAT Solar – 2.6MW
- UAE Wind at Vailoa Aleipata – 550KW
- STEC biomass – 2MW
- Alaoa Flood Control Dam – GCF
- Sili Hydro – 2MW - GCF
- Wind for Savaii – 2.75MW
- Biodiesel
- Liquid Natural Gas



SUMMARY OF PROJECT FUNDING

PROJECTS ACCUMULATED FINANCING SUMMARIES AS OF DECEMBER 2016

As at 31st December 2016.

	Audited Bals 30/06/2016	Un-audited Bals (Jul - Dec 2016) Additions	Loan conversions	PSEP Accum Bals at 31/12/16	C/Parts %
POWER SECTOR EXPANSION PROJECT (PSEP)					
<i>ADB Loan Contributions</i>	60,018,429	58,557		60,076,986	27%
<i>JICA Loan Contributions</i>	89,609,053	88,780		89,697,833	40%
<i>ADB Loan-grant Contributions</i>	30,210,186	248,531	-25,819,778	4,638,939	2%
<i>ADB Loan-grant Conversions (Jul16)</i>			25,819,778	25,819,778	12%
<i>AUSAID Grants Contributions</i>	18,488,865	0		18,488,865	8%
<i>EPC Contributions to PSEP Projects</i>	24,204,103	1,466,950		25,671,053	11%
Total Foreign Grants/Loan and EPC Contributions	222,530,636	1,862,819	0	224,393,455	100%
RENEWABLE ENERGY DEV & POWER SECTOR REHABS PROJECTS					
<i>ADB/Donor Agencies Grants Contributions</i>	8,674,765	13,470,419		22,145,184	91%
<i>EPC Contributions to Renewable Projects</i>	834,487	1,443,459		2,277,946	9%
Total Donor Agencies and EPC Contributions	9,509,252	14,913,878	0	24,423,130	100%
PMU ADB PROJECTS FINANCING OVERALL SUMMARY (PSEP + REDPSRP)					
<i>Loan funded projects</i>	179,837,668	395,868	-25,819,778	154,413,758	62%
<i>Grants funded projects</i>	27,163,630	13,470,419	25,819,778	66,453,827	27%
<i>EPC overall counterparts towards ADB projects</i>	25,038,590	2,910,409	0	27,948,999	11%
Total PMU Accumulated Financial Summary -ADB Projects	232,039,888	16,776,697	0	248,816,585	100%

LESSONS LEARNT

- Unsolicited proposals
- Lack of capacity in local Private Sector
- Commercial banks can not fund projects
- Some technologies are not yet proven and it is hard to get investors
- Lack of support from village communities
- Contradicts with other government activities
- No funds
- Environment concerns and requirements
- Feed in tariff becomes not competitive when fuel price drops
- Feed in tariff was compared to diesel avoided cost
- Instability of grid caused by transient/variable RE
- Bankable PPA
- PPA negotiations
- Evaluation of tenders to be more flexible to the best interest of EPC
- Incentives to be upfront
- Good Tender Document
- Flexibility of Program



WAY FORWARD

- EPC to cancel all undelivered PPAs
- EPC to issue RFP to only IPPs with funds and proven technologies
- Feed in tariff to be cost based
- Promote PPP and EPC to invest
- Look for more grants
- Partnership with village communities
- Storage and Smart Grid
- Robust Transmission and Distribution Network
- Collaborative approach



FAAFETAI

