Team 4

GROUP ASSIGNMENT 2 – PROJECT CASE OVERVIEW PRESENTATION

BRIGHTSOURCE: CHALLENGES AND PROSPECTS FOR A CONCENTRATED SOLAR POWER PLANT

Presented by:

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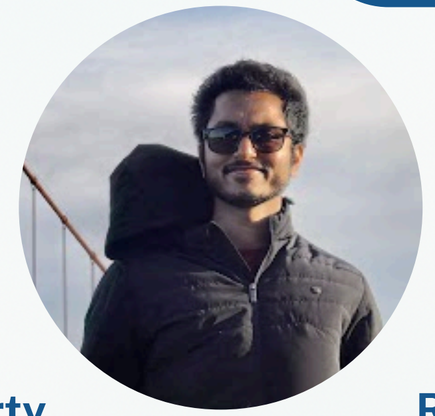
TEAM INTRODUCTION - MEET TEAM 4

Anurekha Chakraborty



Rajeev Gabbireddy

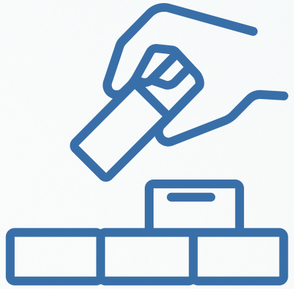
Shreya Anil Mishra

Gan Song

PROJECT SPONSOR ORGANIZATION – BRIGHTSOURCE ENERGY

Organizational Background

- **Founded** in 2004, Oakland, California
- **By** former Luz International engineers
- **Specializes** in power tower solar
- **Builds** large-scale heliostat plants



Early Success

- Built **6 MW** demo plant in Israeli desert
- Ran **15,000+ hours** in harsh conditions
- Proved **tower + heliostat system** works
- Enabled **utility-scale expansion**

Financial Support

- Raised **$615 million** by 2013
- **Investors**: Google, NRG Solar, Chevron, BP, Alstom
- **$1.6 billion** federal loan guarantee

PROJECT BACKGROUND – IVANPAH SOLAR ELECTRIC GENERATING SYSTEM

Project Overview

- **Location**: Mojave Desert, CA (3,600 acres)
- **Managed by:** US Bureau of Land Management
- **Construction started:** October 2010
- **Operational since:** 2013

Technical Highlights

- 3 solar towers; 170,000 smart mirrors
- Sun-tracking mirrors heat boilers
- Dry cooling cuts water use by 90%

Power Generation

- 2.2 billion, 392 MW plant
- Powering 140,000 homes
- Long-term PP contracts with Pacific Gas and Electric and Southern California Edison

BENEFITS TO BRIGHTSOURCE ENERGY

Environmental Impact

- Reduces 400,000 metric tonnes of carbon dioxide emissions annually
- Equivalent to removing 70,000 vehicles from road each year

Economic and Social Contributions

- Created 2,600+ skilled labor jobs
- Maintained safety with 1 injury per 200,000 labor hours
- 70% of equipment sourced from within the United States

Wildlife Protection

- Actively protected desert tortoise habitat
- Approved to relocate 1,200 tortoises; only 172 moved

PROJECT OBJECTIVES

Energy, Technology, and Environment

Deliver Reliable and Sustainable Energy

- Generate 392 MW by solar thermal technology
- Support California’s renewable energy targets - Renewable Portfolio Standard law

Prove Commercial Viability of Technology

- Demonstrate BrightSource’s power-tower system commercially
- Validate performance for large-scale energy providers

Protect Environment While Generating Power

- Dry cooling cuts water use by 90%
- Low-impact mounts – minimal soil disturbance
- Natural Habitat maintained

PROJECT OBJECTIVES

Cost Reduction and Global Expansion

Gain Investor Confidence and International Expansion

- Prove capability by delivering on time and within budget
- Leverage Ivanpah success to win projects, attract funding, and build global partnerships

Drive Down Future Costs

- Use data to improve design and performance
- Boost efficiency with smart software and larger towers
- Aim for 40% cost reduction in future projects

MAJOR DELIVERABLES AND SUB-DELIVERABLES

Ivanpah

1.Project Initiation

2.High Level Planning

3.Site Identification

4.Pre Feasability Study

5.Feasability Study

6. Financing & Contracts

7.Detailed Design

8.Construction

9.Equipment Acquisition

10.Electric Works

11.Mechanical Works

12.Commision

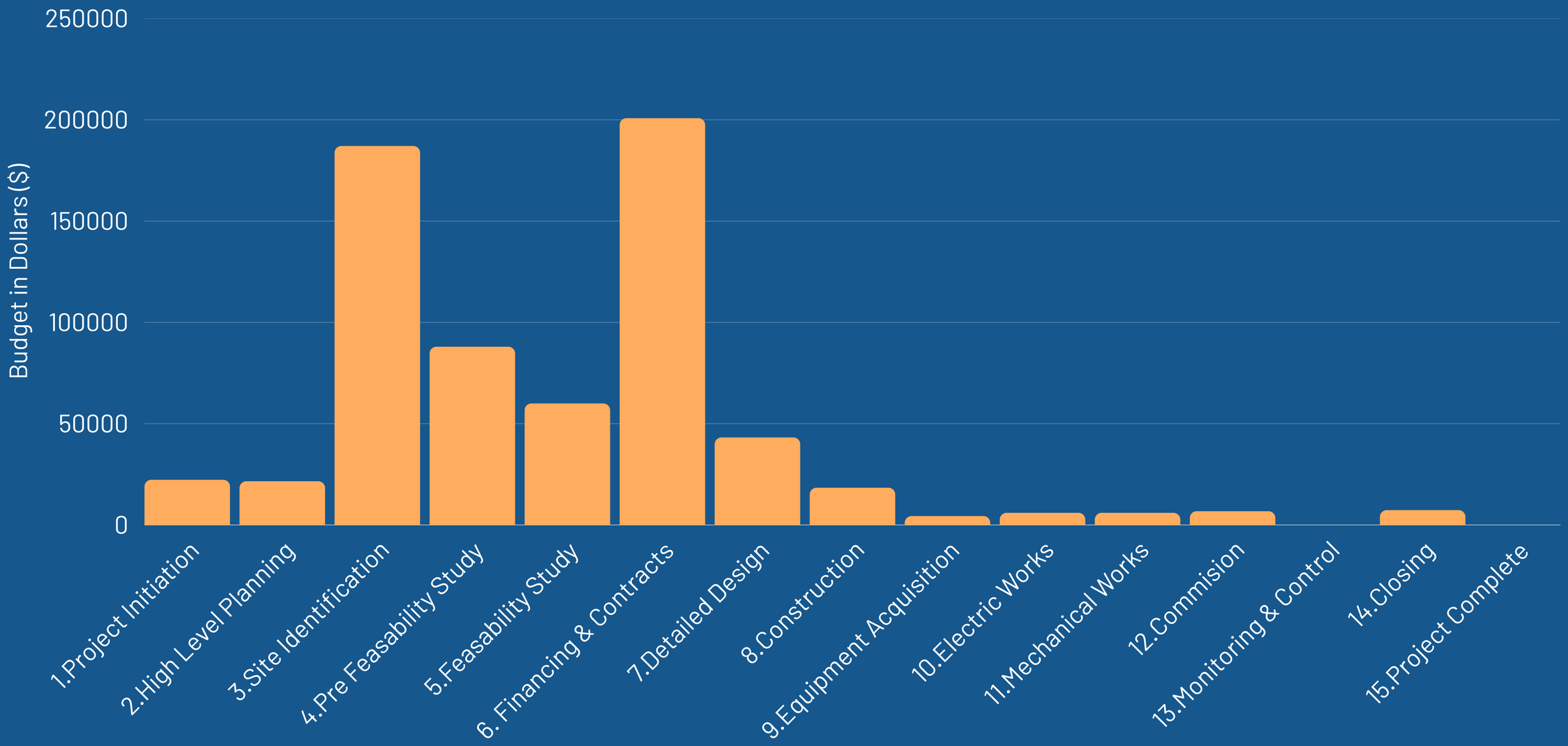
13.Monitoring & Control

14.Closing

15.Project Complete

All deliverables & subdeliverables are mentioned in slides 14 & 15

TOTAL BUDGET: $833,915



SUMMARY SCHEDULE

Site selection & initial planning

2006

2007-2009

Permits & environmental review

Construction begins

2010

2012

Peak construction workforce (2,100+ workers)

Project completion & operational launch

Mid-2013

ACCEPTANCE CRITERIA

- Full regulatory and environmental compliance (including tortoise relocation)
- Achieve 392 MW capacity and supply power to 140,000 homes
- Auxiliary gas system use ≤ 5% of total output
- Complete within $2.2 billion budget and by mid-2013
- Formal approval from all key stakeholders

5 FORESEEABLE RISKS AND THEIR IMPACT ON PROJECT OBJECTIVES

No	Risk	Consequences
01	**Environmental Regulatory Risk**	Delays in approvals, suspension of construction, and increased environmental costs affect schedule and budget targets.
02	**Public Opposition and Litigation Risk**	Forced adjustment of project design may increase consultation time and legal response costs.
03	**Technological Risk**	Potential failures or underperformance may breach power generation contract requirements
04	**Financial Risk**	Delays or cost escalation may threaten fund recovery and financial stability.
05	**Market & Policy Risk**	Lower profitability and challenges in securing power purchase agreements limit growth

THANK YOU!

MAJOR DELIVERABLES AND SUB-DELIVERABLES

Task Name	Duration	Start	Finish	Predec	Baseline Cost	Baseline Work
Concentrating Solar Power Plant WBS	**740 days**	**Mon 1/7/30**	**Fri 11/5/32**		**$833,915.00**	**12,383 hrs**
1 Project Initiation	**20 days**	**Mon 1/7/30**	**Fri 2/1/30**		**$22,310.00**	**374 hrs**
1.1 Prepare stakeholder analysis	10 days	Mon 1/7/30	Fri 1/18/30		$13,670.00	230 hrs
1.2 Create project charter	5 days	Mon 1/21/30	Fri 1/25/30	2	$7,200.00	120 hrs
1.3 Charter created	4 days	Mon 1/28/30	Thu 1/31/30	3	$0.00	0 hrs
1.4 Hold project kickoff meeting	1 day	Fri 2/1/30	Fri 2/1/30	4	$1,440.00	24 hrs
2 High Level Planning	15 days	Mon 2/4/30	Fri 2/22/30	5	$21,600.00	360 hrs
3 Site Identification	**175 days**	**Mon 2/25/30**	**Fri 10/25/30**		**$187,075.00**	**2,695 hrs**
3.1 Identification of potential site(s)	12 wks	Mon 2/25/30	Fri 5/17/30	6	$67,200.00	960 hrs
3.2 Funding of project development	13 wks	Mon 5/20/30	Fri 8/16/30	8	$66,850.00	970 hrs
3.3 Development of rough technical concept	10 wks	Mon 8/19/30	Fri 10/25/30	9	$53,025.00	765 hrs
4 Pre-Feasibility Study	**110 days**	**Mon 10/28/30**	**Fri 3/28/31**		**$88,000.00**	**880 hrs**
4.1 Assessment of different technical options	6 wks	Mon 10/28/30	Fri 12/6/30	10	$24,000.00	240 hrs
4.2 Cost/benefits Analysis	2 wks	Mon 12/9/30	Fri 12/20/30	12	$8,000.00	80 hrs
4.3 Permitting needs Assessment	2 wks	Mon 12/23/30	Fri 1/3/31	13	$8,000.00	80 hrs
4.4 Market assessment	12 wks	Mon 1/6/31	Fri 3/28/31	14	$48,000.00	480 hrs
5 Feasibility Study	**75 days**	**Mon 3/31/31**	**Fri 7/11/31**		**$60,000.00**	**600 hrs**
5.1 Technical and financial evaluation of preferred option	8 wks	Mon 3/31/31	Fri 5/23/31	15	$32,000.00	320 hrs
5.2 Assessment of financing options	4 wks	Mon 5/26/31	Fri 6/20/31	17	$16,000.00	160 hrs
5.3 Initiation of permitting process	1 wk	Mon 6/23/31	Fri 6/27/31	18	$4,000.00	40 hrs
5.4 Development of rough technical concept	2 wks	Mon 6/30/31	Fri 7/11/31	19	$8,000.00	80 hrs
6 Financing/Contracts	**95 days**	**Mon 7/14/31**	**Fri 11/21/31**		**$200,800.00**	**2,920 hrs**
6.1 Project Investment & Finance	6 wks	Mon 7/14/31	Fri 8/22/31	20	$67,200.00	960 hrs
6.2 Land Acquisition	8 wks	Mon 8/25/31	Fri 10/17/31	22	$89,600.00	1,280 hrs
6.3 Permit Applications	1 wk	Mon 10/20/31	Fri 10/24/31	23	$7,200.00	120 hrs
6.4 Contracting strategy Development	2 wks	Mon 10/27/31	Fri 11/7/31	24	$22,400.00	320 hrs
6.5 Supplier selection and contract negotiation	2 wks	Mon 11/10/31	Fri 11/21/31	25	$14,400.00	240 hrs
7 Detailed Design	**30 days**	**Mon 11/24/31**	**Fri 1/2/32**		**$43,200.00**	**720 hrs**

MAJOR DELIVERABLES AND SUB-DELIVERABLES

Task Name	Duration	Start	Finish	Predec	Baseline Cost	Baseline Work	Add New Column
7 Detailed Design	**30 days**	**Mon 11/24/31**	**Fri 1/2/32**		**$43,200.00**	**720 hrs**	
7.1 Preparation of detailed design for all relevant lots	15 days	Mon 11/24/31	Fri 12/12/31	26	$21,600.00	360 hrs	
7.2 Preparation of project implementation Schedule	10 days	Mon 12/15/31	Fri 12/26/31	28	$14,400.00	240 hrs	
7.3 Finalization of permitting process	5 days	Mon 12/29/31	Fri 1/2/32	29	$7,200.00	120 hrs	
8 Construction	**205 days**	**Mon 1/5/32**	**Fri 10/15/32**		**$180,400.00**	**3,280 hrs**	
8.1 Site Preparation	15 days	Mon 1/5/32	Fri 1/23/32	30	$13,200.00	240 hrs	
8.2 Access Road	20 days	Mon 1/26/32	Fri 2/20/32	32	$17,600.00	320 hrs	
8.3 Foundations	25 days	Mon 2/23/32	Fri 3/26/32	33	$22,000.00	400 hrs	
8.4 Support Structures	45 days	Mon 3/29/32	Fri 5/28/32	34	$39,600.00	720 hrs	
8.5 Site Drainage	40 days	Mon 5/31/32	Fri 7/23/32	35	$35,200.00	640 hrs	
8.6 Office Space	60 days	Mon 7/26/32	Fri 10/15/32	36	$52,800.00	960 hrs	
9 Equipment Acquisition	10 days	Mon 1/5/32	Fri 1/16/32	32SS	$4,400.00	80 hrs	
10 Electrical Works	15 days	Mon 1/19/32	Fri 2/6/32	38	$6,000.00	120 hrs	
11 Mechanical Works	15 days	Mon 1/19/32	Fri 2/6/32	38	$6,000.00	120 hrs	
12 Commissioning	10 days	Mon 2/9/32	Fri 2/20/32	40	$6,800.00	80 hrs	
13 Monitoring & Controlling	**690 days**	**Mon 2/25/30**	**Fri 10/15/32**		**$0.00**	**0 hrs**	
13.1 Monitor & control project work	690 days	Mon 2/25/30	Fri 10/15/32	8SS	$0.00	0 hrs	
13.2 Control schedule	690 days	Mon 2/25/30	Fri 10/15/32	43SS	$0.00	0 hrs	
13.3 Verify scope	690 days	Mon 2/25/30	Fri 10/15/32	44SS	$0.00	0 hrs	
13.4 Control scope	690 days	Mon 2/25/30	Fri 10/15/32	45SS	$0.00	0 hrs	
13.5 Control cost	690 days	Mon 2/25/30	Fri 10/15/32	46SS	$0.00	0 hrs	
14 Closing	**14 days**	**Mon 10/18/32**	**Thu 11/4/32**		**$7,330.00**	**154 hrs**	
14.1 Customer final acceptance Secured	1 day	Mon 10/18/32	Mon 10/18/32	47	$0.00	0 hrs	
14.2 Prepare final report	4 days	Tue 10/19/32	Fri 10/22/32	49	$3,670.00	70 hrs	
14.3 Conduct Lesson Learned	4 days	Mon 10/25/32	Thu 10/28/32	50	$1,670.00	38 hrs	
14.4 Document Lessons Learned	5 days	Fri 10/29/32	Thu 11/4/32	51	$1,990.00	46 hrs	
15 Project Complete	1 day	Fri 11/5/32	Fri 11/5/32	41,52	$0.00	0 hrs	