

**Overview of CSP today
and
thoughts on DOE's CSP Program
from an industry perspective**

Dr. Fred Morse
Chairman, CSP Division SEIA
and
Senior Advisor, US Operations
Abengoa Solar

Why CSP and why now?

- **Necessity** – the utilities' other options (coal, nuclear or NG) have significant long term risks
- **Public opinion** favors solar
- Favorable but still unreliable **policies**, such as the RPS and the ITC (both of which are essential)
- **Uniqueness** of thermal energy storage

Awareness of CSP

- **Utilities** – Growing fast where good DNI and policies exist
- **Policy makers** – Generally lagging as evidenced by inadequate or unreliable policies at the federal and state levels
- **Investors** – Growing fast as evidenced by news articles and conferences but lagging wind and PV investments, held back by ITC uncertainty and today's financial market situation

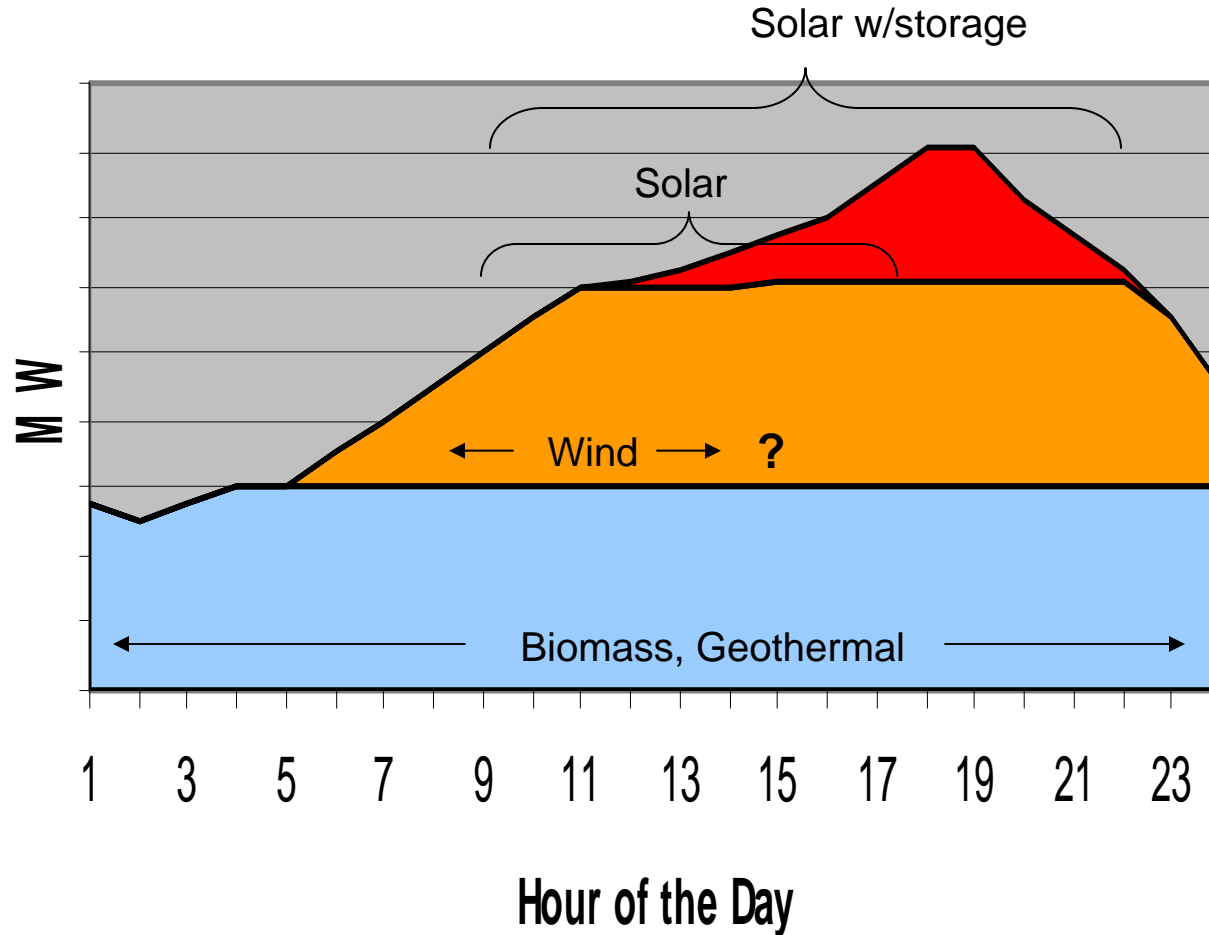
Attributes of CSP in the eyes of utilities

- Utilities are familiar with **steam** generation
- Suitability for utility **scale** installations of 100MW or more
- Stable, known and decreasing costs and zero carbon emissions provide **hedge** against NG price volatility and carbon caps
- Other generation options have significant **risks**
- Ability to provide **firm dispatchable output** which is of **great value** to utilities

Summer Generation Profile

Renewable Resource Fit

(from Barbara Lockwood, APS)



Additional utility attributes

- **Large, multi-national corporations are now involved in every part of chain**
 - Project and Technology Developers
 - Utilities and Independent Power Producers
 - Engineering and Construction Companies
- **Quality counterparties reduce overall CSP project risk**
 - Large balance sheets
 - Power and construction expertise
 - Strategic technology deployment

Abengoa Solar – one of the new
large multinational CSP
companies

Abengoa is a technology company applying innovative solutions for sustainable development in the infrastructure, environment and energy sectors.

Mature. Founded **1941**

Profitable. Sales in 2006 of **\$3.5 billion**

Global. Present in more than **70 countries**, 55% of business outside Spain

Large. Over **20,000 employees** (13,600 in 2006)

Public. **Quoted** on the Madrid Stock Exchange (ABG)

Five self standing companies, one of which is Abengoa Solar

Abengoa
Solar



↓
Solar Energy

Abengoa
Bioenergy



↓
Bioenergy

Befesa



↓
Environmental
Services

Telvent



↓
Information
Technologies

Abeinsa



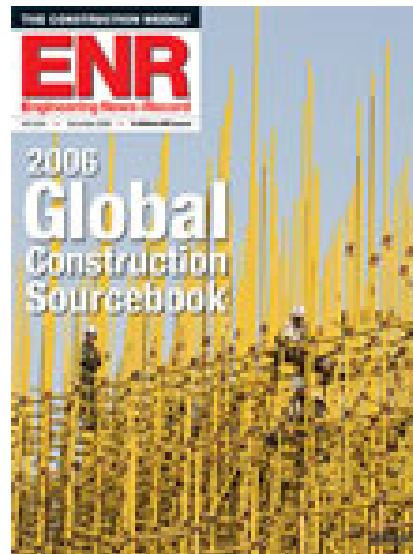
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Engineering and
Industrial
Construction

ABEINSA – the in-house EPC contractor



Abeinsa is ranked by ENR as the third largest international Power Contractor

December 2006

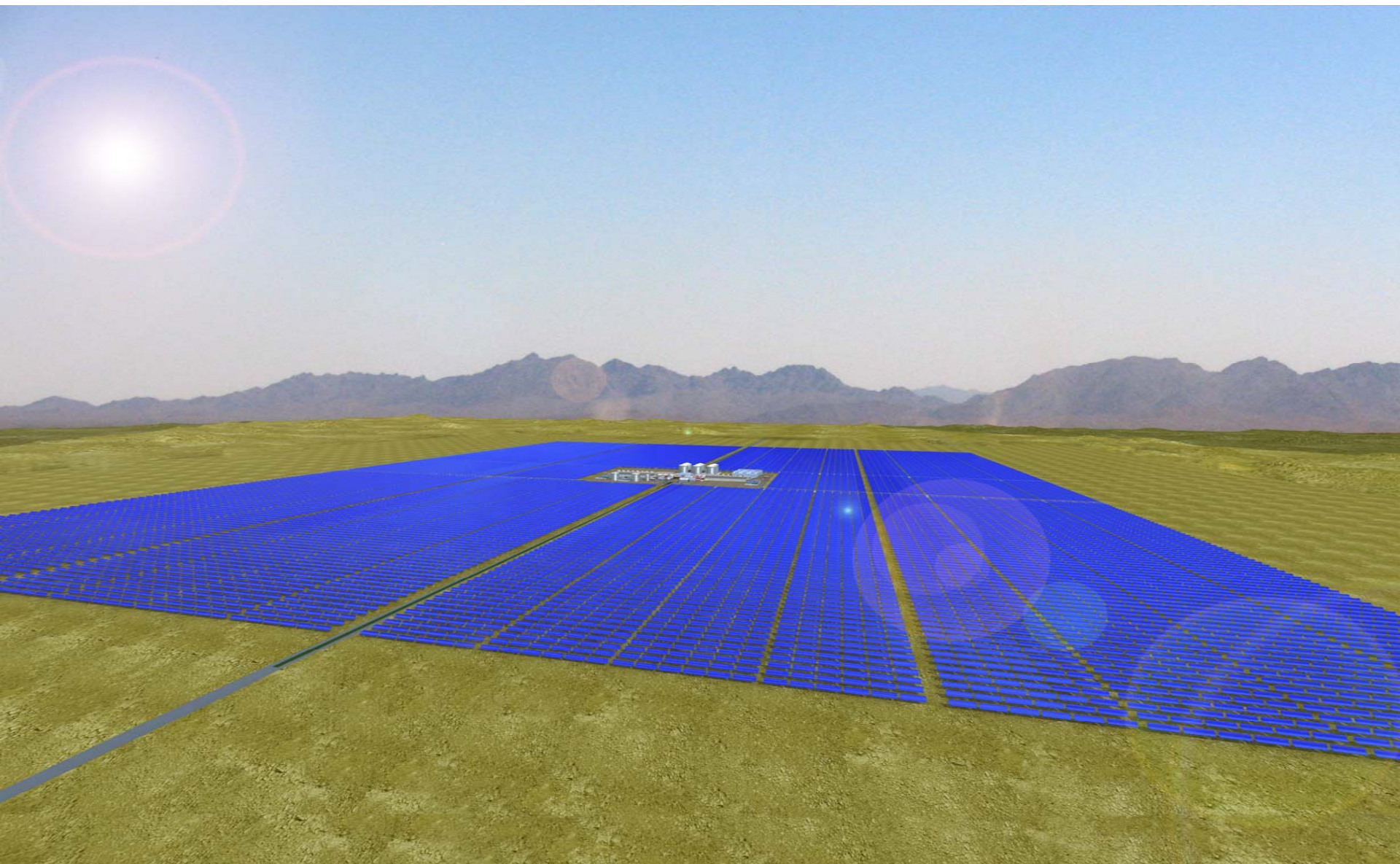


Power	
Top 10 international contractors in Power	
1. Chiyoda Corp	
2. Bechtel	
3. Abeinsa	
4. Cegelec	
5. Grupo ACS	
6. Foster Wheeler Ltd.	
7. China National Machinery Industry Corp.	
8. Vinci	
9. Tractebel Engineering (Suez)	
10. Washington Group International	

Abengoa's company focused on construction of energy plants with extensive experience in building solar energy plants







Attributes of CSP in the eyes of policy makers

- **Very large domestic resource** potential
- **Carbon free** electricity
- **Potential for cost** reduction
- **Economic benefits** will result from its development
- Increased **public awareness** and support of the benefits of clean energy

Attributes of CSP in the eyes of investors

- **Scalable**
- With a good Power Purchase Agreement, the return on investment can be adequate to encourage **main-stream** equity and favorable debt financing terms.
- Once debt is paid, operates with no fuel – has potential of becoming a “**clean cash cow**”.

Prospects for capital flows into CSP

- Abengoa Solar – financed PS10, PS20, Solnova 1 and 3 (50MW) and Algeria and Morocco ISCC with **commercial debt** and will do the same for Solana (280 MW)
- Solar Millennium – financed Andasol 1 and 2 with **commercial debt**
- Acciona – financed Nevada Solar 1 (64MW) with **commercial debt**
- Trough companies do not see a problem attracting **tax equity investors and commercial debt** as long as the ITC is in place
- There seems to be ample **equity** available for start-ups as evidenced by Ausra, SkyFuel, eSolar, Bright Source and Solar Reserve

The CSP Industry

- Technologies – trough, tower, dish engine, linear Fresnel, and CPV, each of which have variations making the industry very robust
- SEIA CSP Division members – About 40 current members covering all of the CSP technologies, from consulting firms to multinational companies, to address federal issues
- CSP Alliance in formation to address state policy, legislative and regulatory issues

The state of the CSP industry

- The strongest it has ever been – Over 400 MW in operation, about 4,300 MW under contract and that amount likely to be under contract in the next year
- Awareness efforts paid off – every SW utility knows of, and has interest in, CSP which they view as a viable resource option
- Regulators are aware and supportive of CSP projects
- Governors know about CSP and the economic and environmental benefits it brings to their states

SEGS	SCE	California	354 MW		Parabolic trough	1985 - 1991	FPL and SunRay
Saguaro	APS	Arizona	1 MW		Parabolic trough	2006	Aciona
Nevada Solar One	Nev. Power	Nevada	64 MW		Parabolic trough	2007	Aciona
SES Solar One – Ph 1	SCE	California		500 MW	Dish/engine	2009 - 2012	SES
SES Solar Two – Ph 1	SDG&E	California		300 MW	Dish/engine	2009 - 2010	SES
None provided	SDG&E	California		100 MW	Parabolic trough	TBD	Bethel Energy
Mojave Solar Park	PG&E	California		553 MW	Parabolic trough	2011	Solel
Solana	APS	Arizona		280 MW	Parabolic trough	2011	Abengoa Solar
Carri Energy Farm	PG&E	California		177 MW	Linear Fresnel	2010	Ausra
Ivanpah	PG&E	California		300 MW	Power tower	2011 – 2012	Bright Source
Broadwell	PG&E	California		200 MW	Power tower	2013	Bright Source
None provided	FPL	Florida		300 MW	Linear Fresnel	2011	Ausra
Beacon	LADWP	California		250 MW	Parabolic trough	2011	FPL
SES Solar One – Ph 2	SCE	California		350 MW ³	Dish/engine	2013 - 2014	SES
SES Solar Two – Ph 2/3	SDG&E	California		600 MW ³	Dish/engine	2011 - 2013	SES
Broadwell	PG&E	California		400 MW ³	Power tower	TBD	Bright Source
		Total	419 MW	4310 MW			

What's in the Way?

- **US Congress** – seems unable to do the right thing re extending the 30% ITC; it is depressing to see how political fighting gets in the way of what both parties claim they support. And we need to keep an eye on our brothers. Federal RPS/FIT and a poor carbon policy are potential threats
- **Cost** - Relatively high cost of electricity but gap is closing fast
- **Transmission** – Inadequate or not available, slow and costly to build and the queue system is broken
- **Land** – Need access to good sites and each ownership type has its own challenges
- **Permitting** - Slow and costly
- **Environmental** – Growing concern over access to the desert regions needed for CSP

Policies for CSP

Current Policies Relevant to CSP

- **Federal**

- 30% Investment Tax Credit –needs to be extended until 2016 or redefined; if not CSP projects will be delayed
- DOE R&D budget – needs to be adequate to support the CSP industry in a period of rapid market growth

- **States**

- CA – Carbon legislation and higher RPS will create a huge market for CSP
- Significant expansion of the RPS in the Southwest
- Property and sales tax exemptions are essential
- Other favorable policies emerging
- States may need to offer bridge incentives to back-stop shorter-term ITC

Other Policies

- “Good” carbon policies needed
- Feed-in Tariffs at state level deserve consideration
- Land access policies needed
- Transmission policies needed

Impact of foreign feed-in tariffs on American CSP industry and market

- CSP Feed In Tariffs exist now in Spain, Portugal, Italy, Greece, Algeria and Israel, and maybe elsewhere
- Only the Feed In Tariff in Spain has had a noticeable impact in the US
 - Strong Spanish companies entered the US market – Acciona, Abengoa and Iberdrola
 - Stimulated interest in state Feed In Tariffs for CSP – CA
 - Stimulated technology advances – towers, storage and more innovation for all CSP

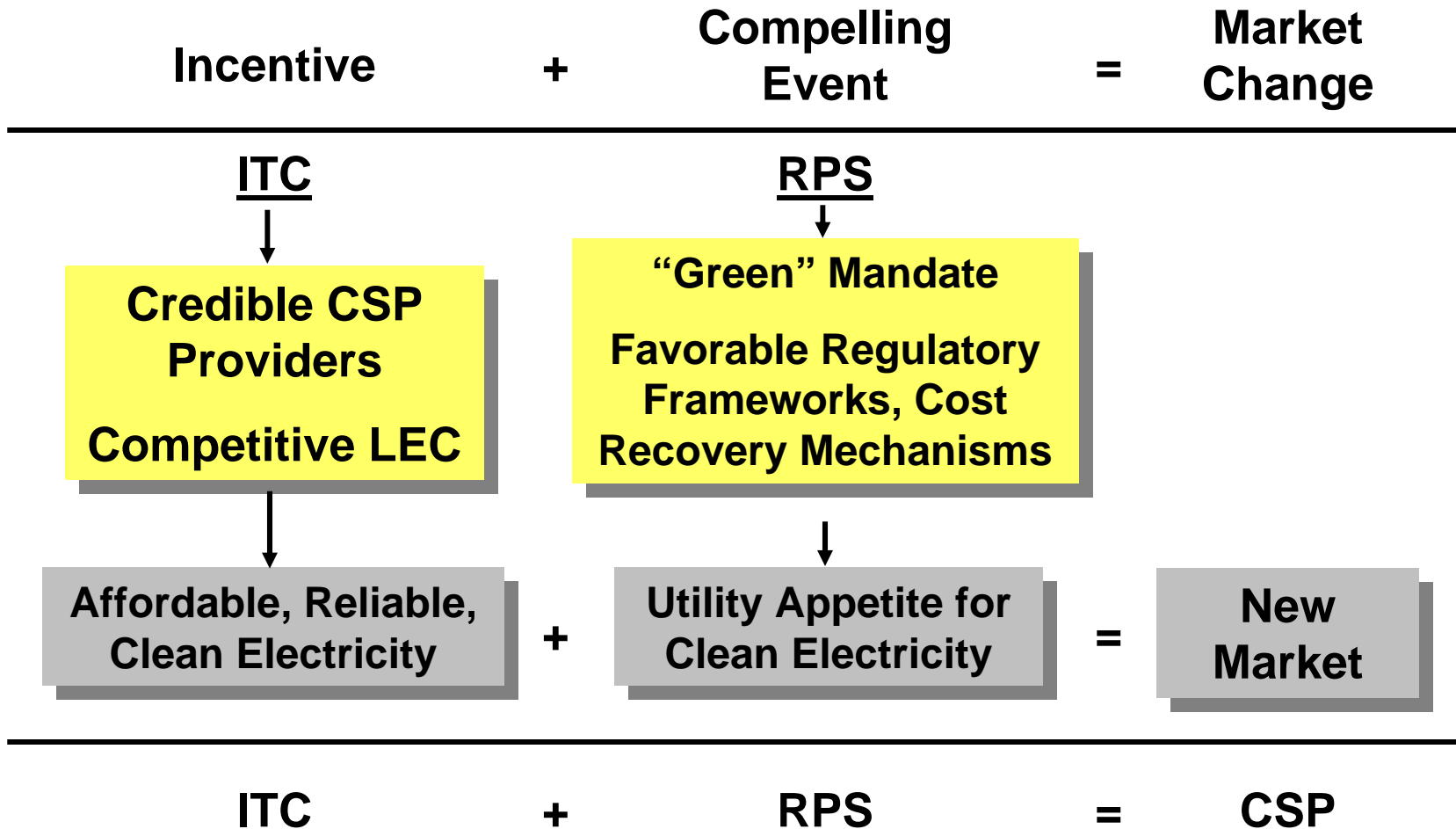
Land Issues

- Siting
 - Bob will address this
- Zones – the new approach for siting renewables
 - BLM – solar in the southwest
 - RETI – all renewables, CA centered but SW inclusive
 - WGA – all renewables and linked to wildlife corridors
 - Clinton Foundation – CSP focus
 - States – Texas, Nevada – renewables
- Challenge – CSP industry, thru its Siting & Transmission Working Group, with DOE's continued leadership and support, must provide input to these zone studies

Transmission Issues

- CSP industry lacks a transmission policy – Katherine Gensler, SEIA, is working on this and will need input and support
- KG and the S&T WG are tracking numerous transmission studies, such as NERC, PIER, NREL and those of various regional groups – more input and support will be needed from the industry and DOE
- The zones all will need transmission right of ways and eventually wires
- Several CSP companies, with CalAWEA, proposed fixes to the CAISO queue mess – Bob will address this

RPS and ITC must both be present



Cost of CSP Electricity

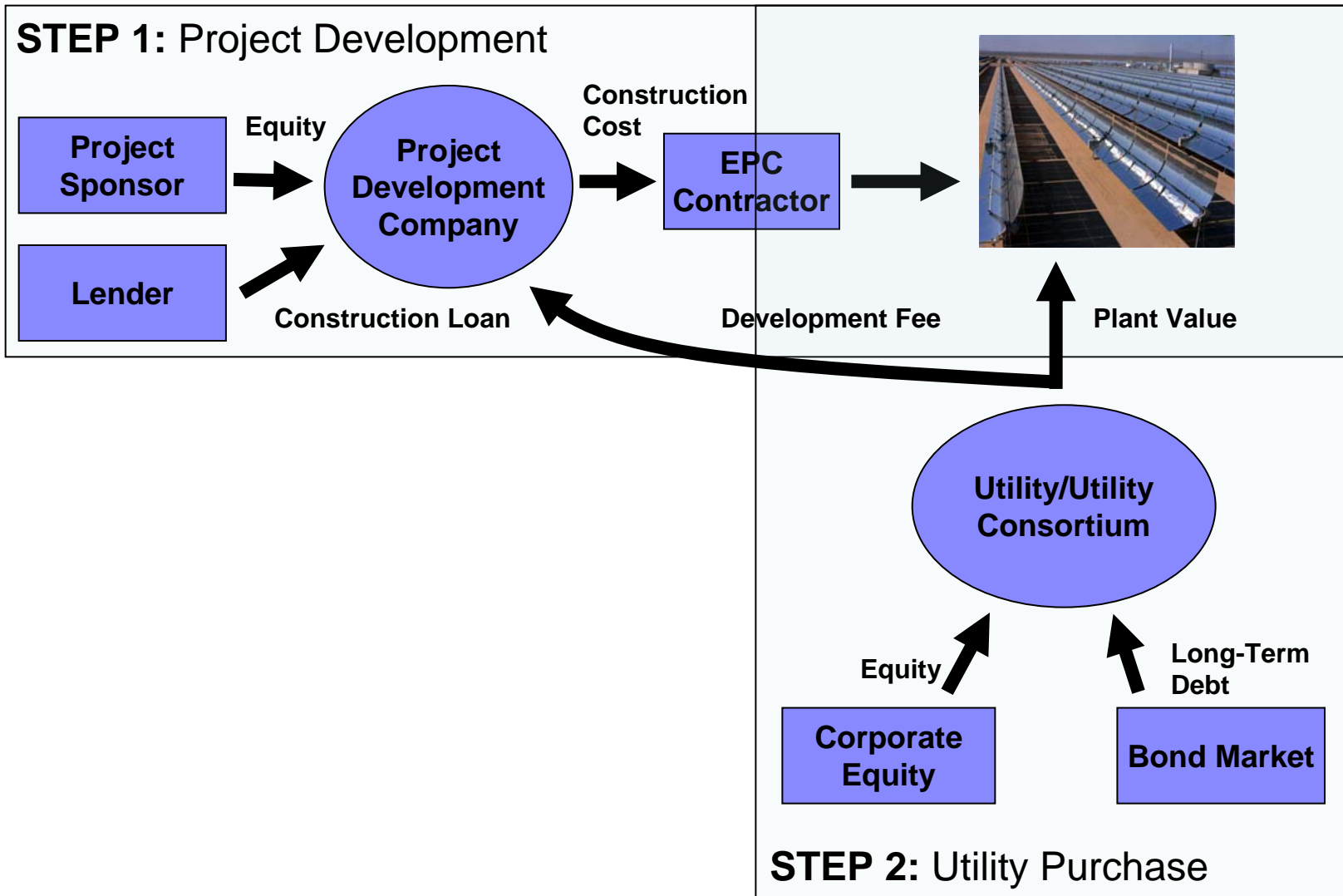
The Cost of CSP

- There are many costs and they are must be carefully defined – nominal, real, constant dollars, first year, levelized and average
- The capital cost and the energy costs seem to be most important to the market
- Cost is not a wish or a hope - it depends on many variables, all of which must be known (the EPC contractor and the investors must know what it is)
- Costs change and that risk must be managed
- The market will find the cost and the value of CSP

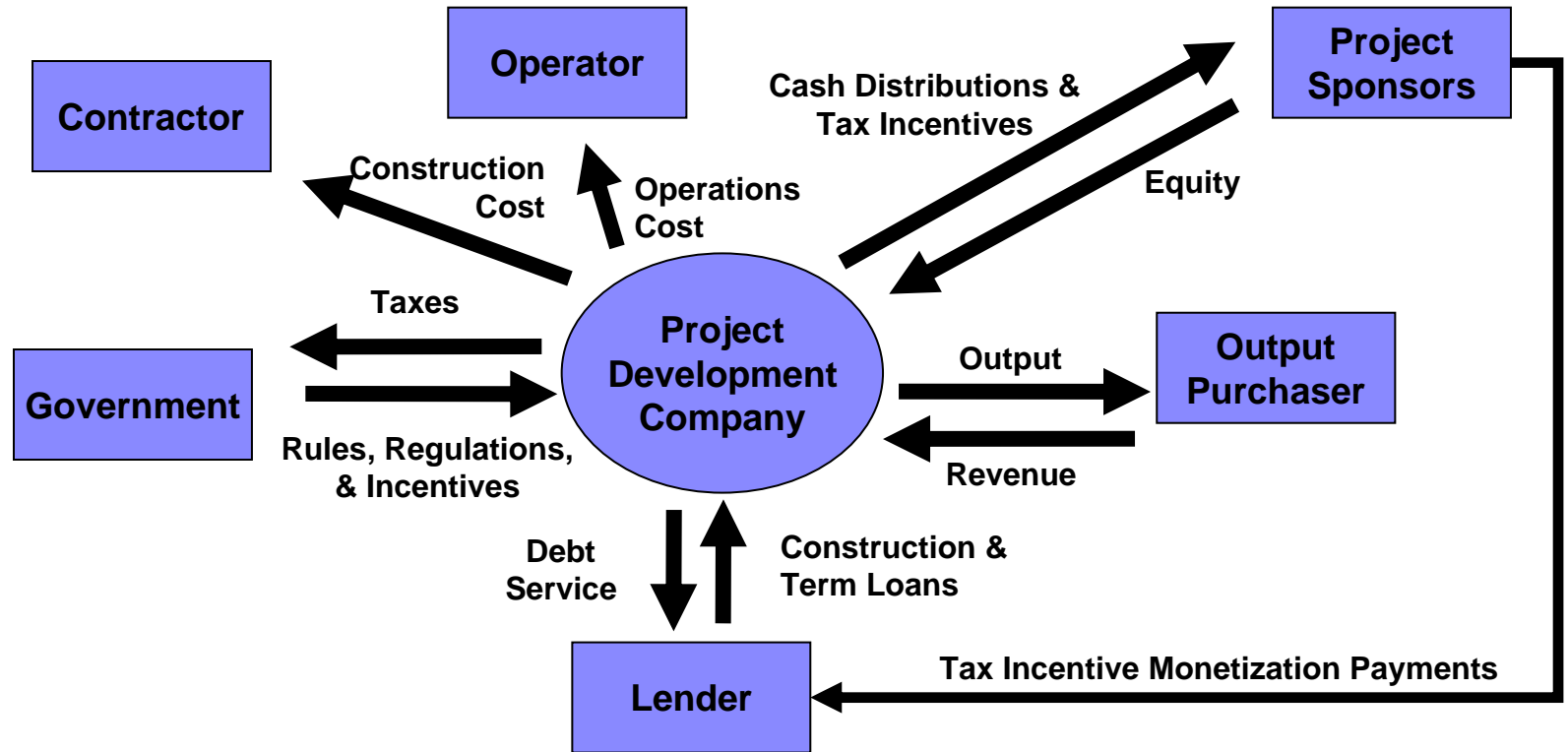
Business model impact cost

- Turn Key – Utility ownership
- IPP
 - Partnership
 - Lease
- Others

Utility Purchase

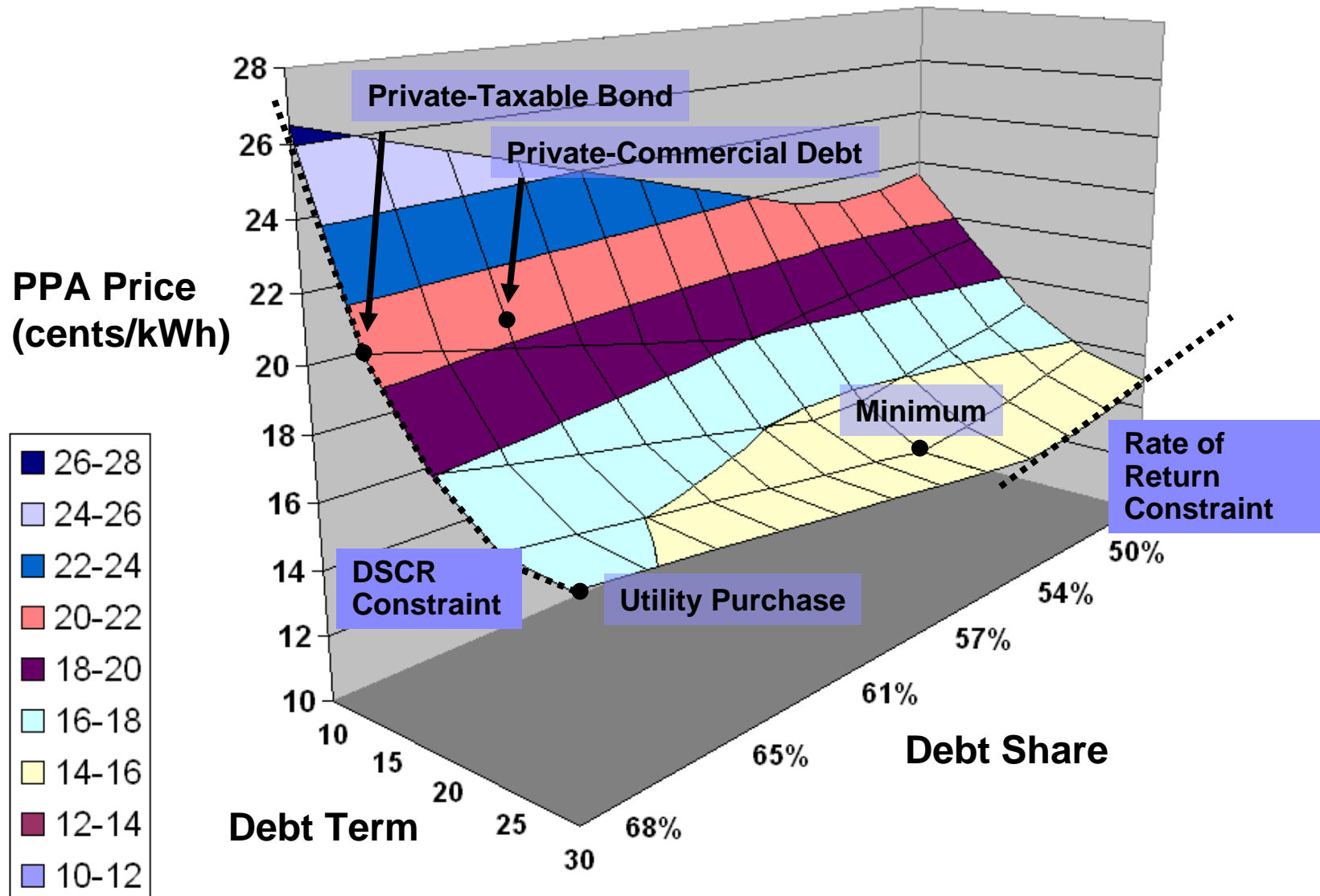


Private Ownership

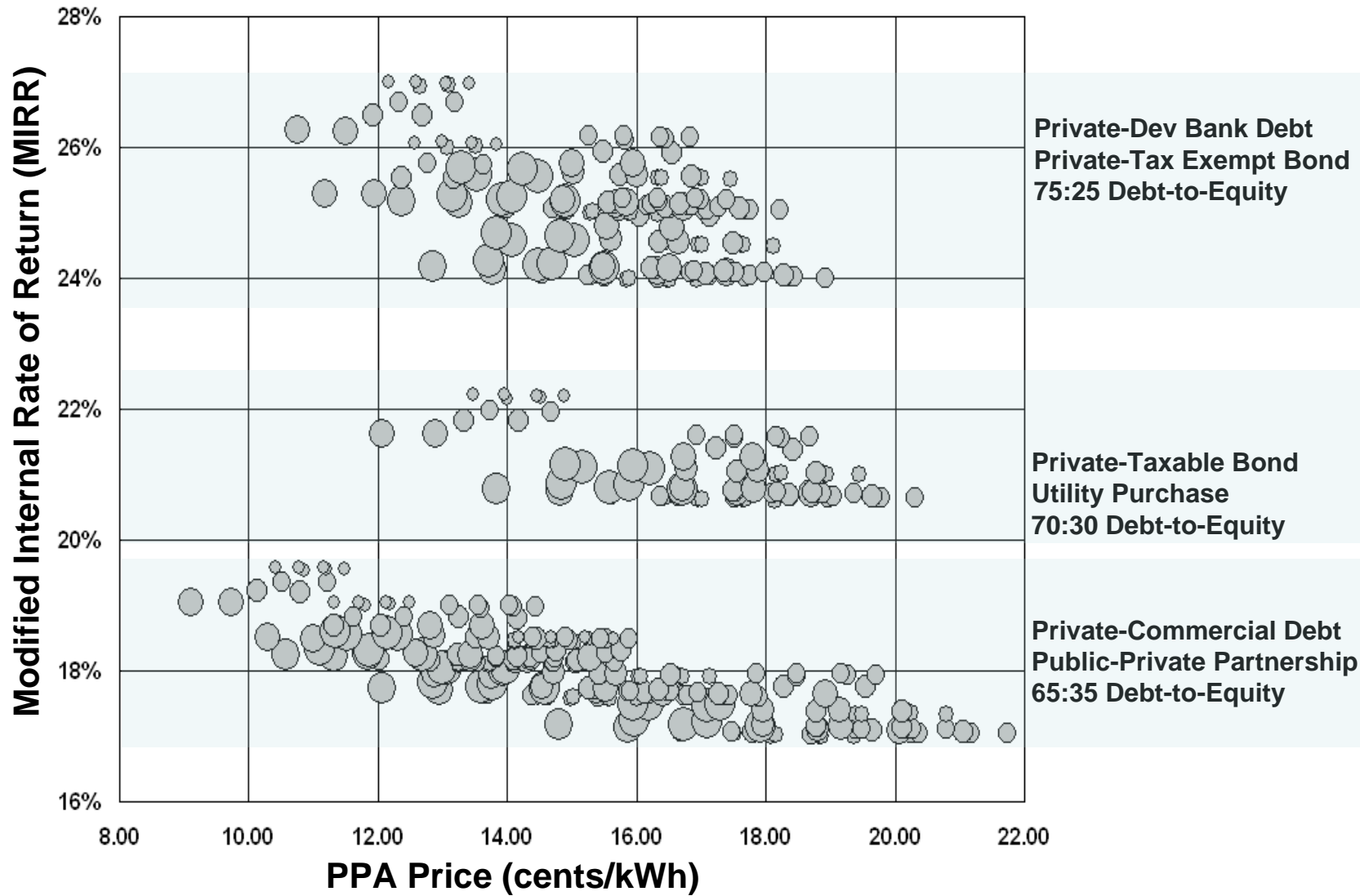


Financial Analysis

Results-50 MW SW Trough Current Policies

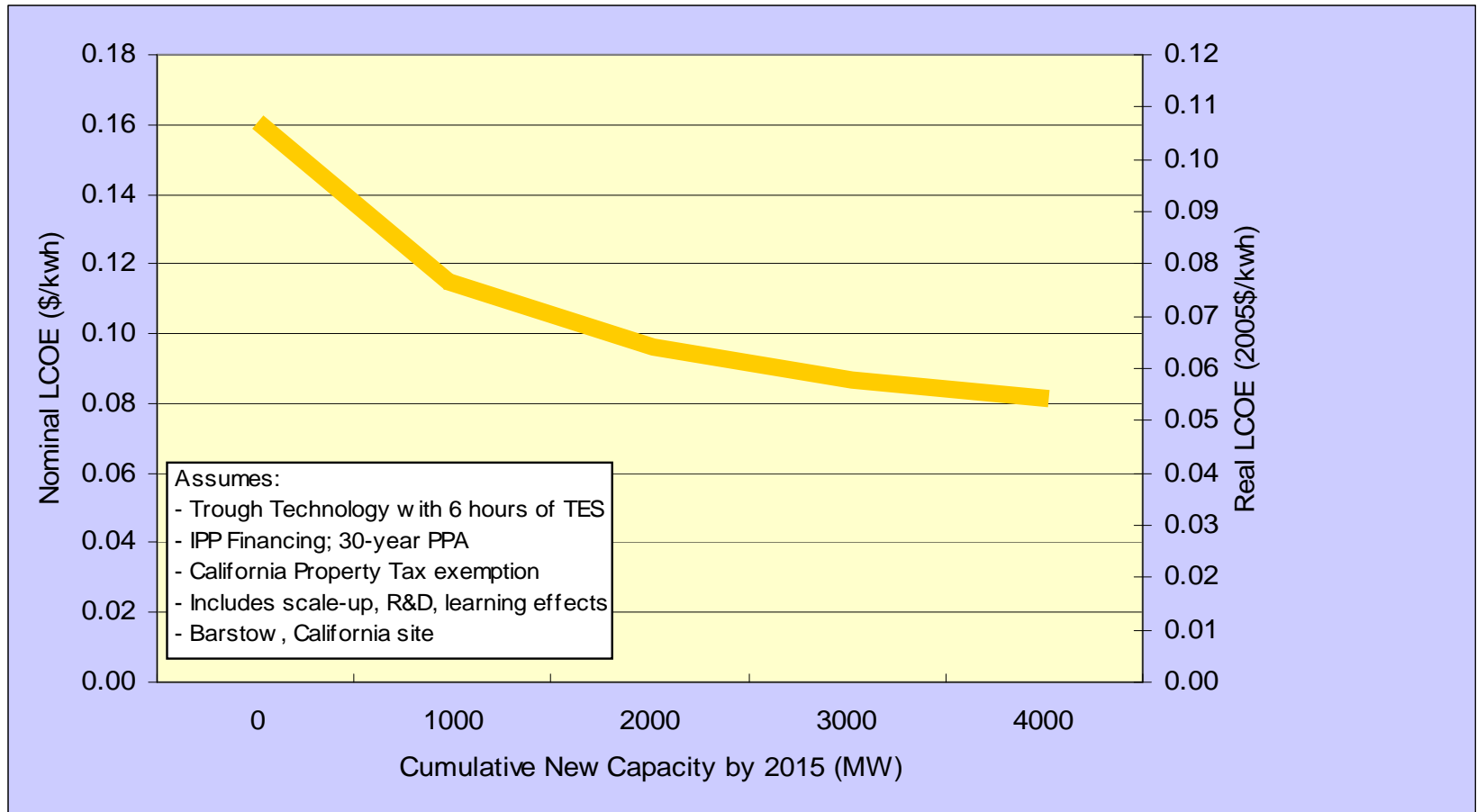


Financial Analysis Results



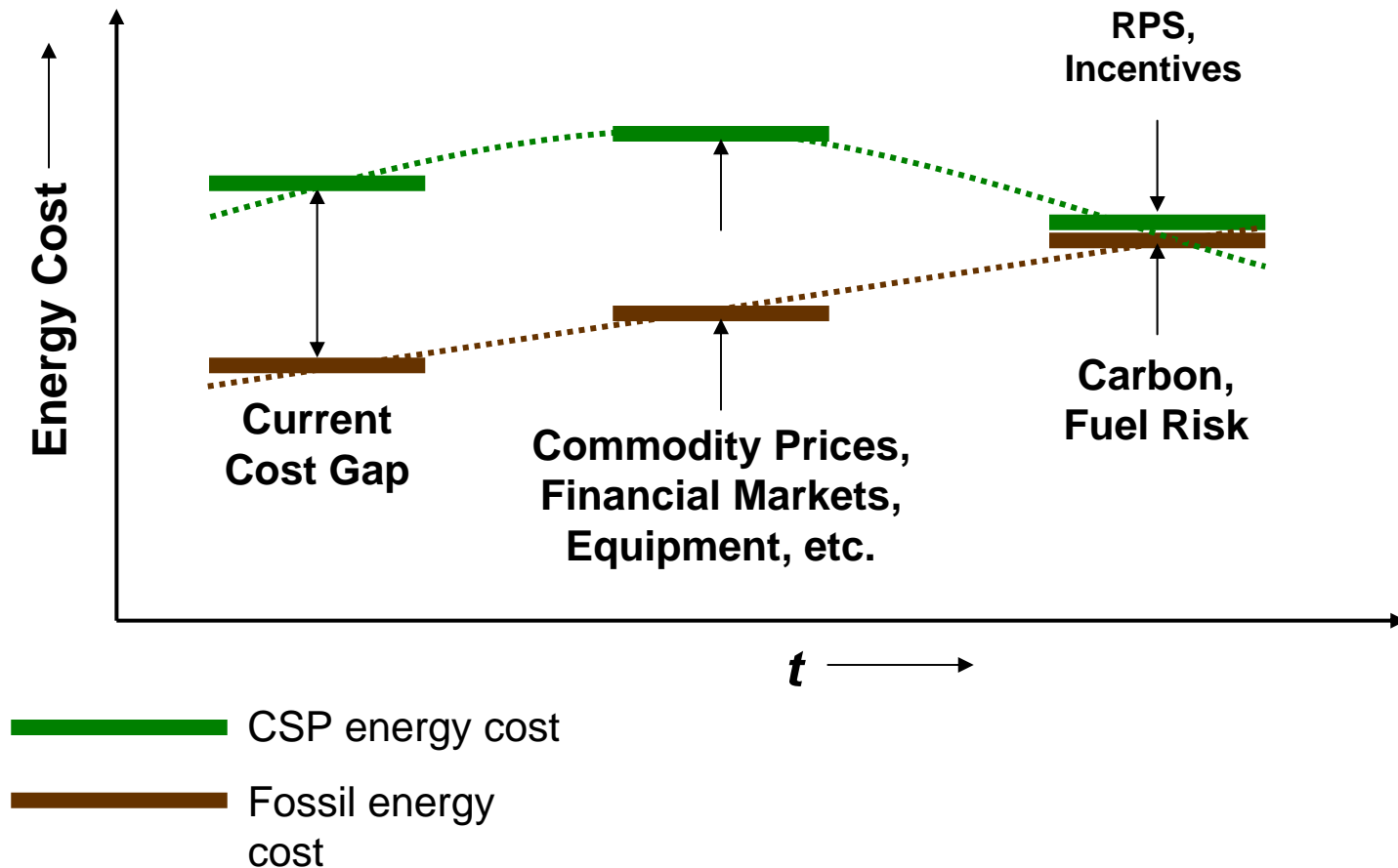
CSP Cost Reduction Prediction

Easy to use but could be misleading



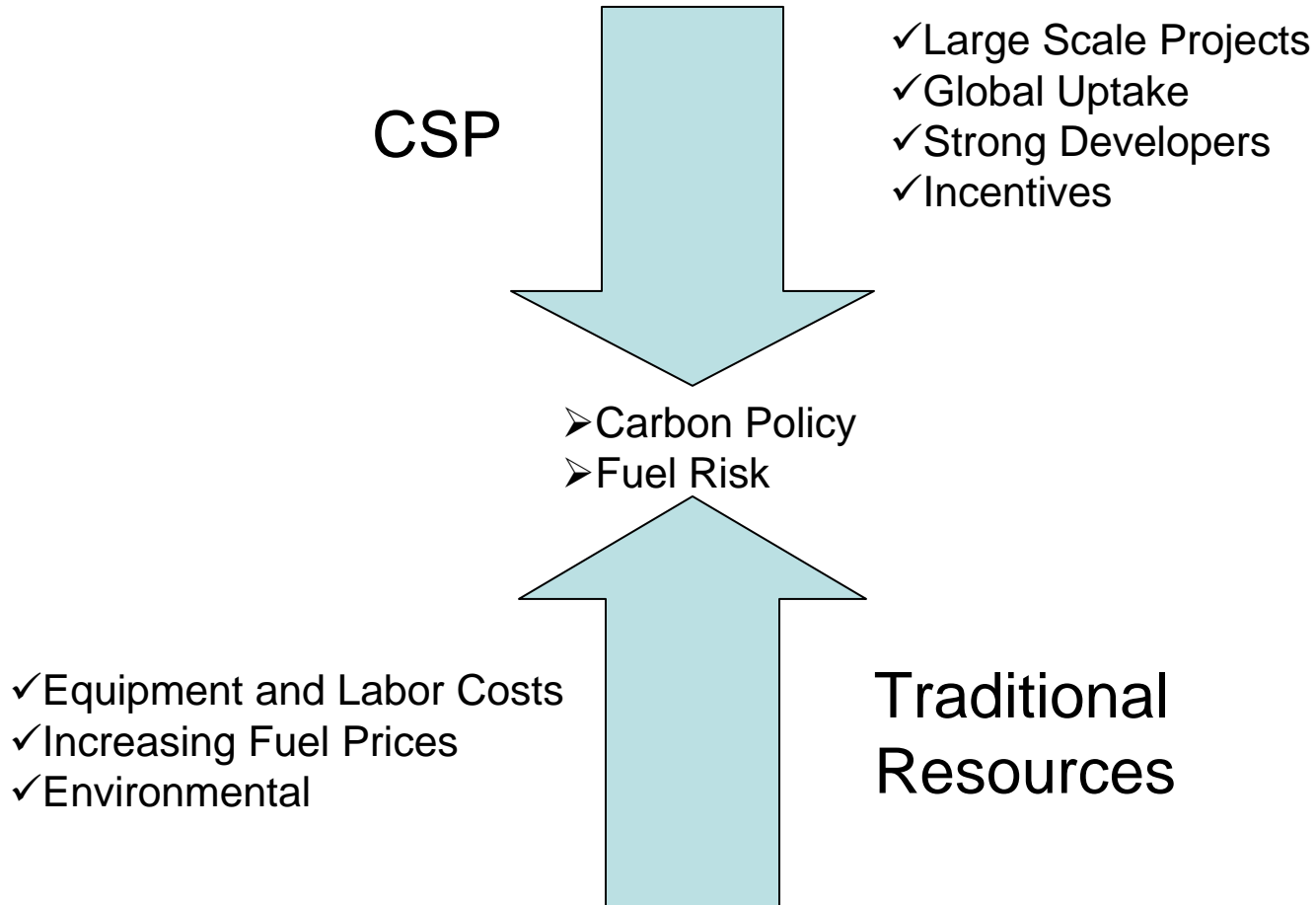
RPS, incentives and policies can close the cost gap between fossil and CSP-derived energy

(from Kate Maracas, Abengoa Solar)



A Narrowing Cost Gap

(From Barbara Lockwood, APS)



Thoughts on the DOE CSP Program

DOE's CSP Program Goal

(modified from an industry perspective)

- To improve the performance and reduce the cost (by support the efforts of the CSP industry and realizing that cost is not just a technology matter) of solar energy systems (CSP) so that solar power (electricity) is cost-competitive with conventional electricity sources (of similar products and value) by 2015 (contracted or operational?), which will accelerate large scale deployment making solar energy a significant contribution to a clean, reliable and flexible U.S. energy supply (acknowledging that siting, transmission and policies must also be addressed)

Value of DOE's Program

- What value does DOE bring to the industry?
 - Being there is value in its self, in fact, is absolutely essential on many levels
 - Mapping, policy analysis, technology R&D are all essential
 - Need more industry-specific support, like today's SNLA/SES effort or yesterdays's KJC O&M effort
- What can DOE do to add value or what is DOE doing that is not value added?
 - The DOE program has always added value (but not enough due to budget limitations)
- Need to return to formal and timely DOE/Industry R&D review and planning meetings

Are the DOE activities in line with its goal of performance and cost improvement

- **Yes**

- The program is supporting its goal

- **No**

- DOE support for the extension of the ITC is absent

- DOE has not provided the non-R&D support that is needed

- DOE's budget prevents it from providing the support that industry now needs as its market is about to expand by an order of magnitude

The overall view of DOE's role, its value, its gaps, and its future opportunity and development.

- A strong and well designed program at DOE is essential for the continued evolution of the CSP industry and its products
- DOE should
 - support industry's efforts to improve its products
 - Perform R&D on new approaches
 - Support industry's efforts to expand its market
- DOE's current program is underfunded relative to the potential of CSP

How should DOE's role and goals change in the future, especially with an increased budget?

- Build a **field test capability** to support innovation and validate performance
- Strengthen the ability of NREL and Sandia to undertake **cooperative work** with the CSP industry
- Expand the **solar resource** data base and develop forecasting techniques
- Add lab staff to support **transmission** studies in support of the CSP industry and to participate actively in regional and sub-regional transmission studies
- Expand the **policy** analysis work (use wind as an example)

Forecast

- **Carbon limits** are coming – will partially or totally close the cost gap
- CSP can **scale up fast** without critical bottleneck materials (we hope) making it a good response option
- **Price** for CSP power is in commercial range and **costs will come down** with increased capacity and will fall below natural gas in the next few years
- **Many technologies options** add certainty to cost reduction projections
- **DOE's CSP** program will continue to grow in size and value
- Economic development and environmental **benefits** will drive state support
- In a very few years, the CSP market in the SW US can grow to **1-2 GW per year**

Conclusions

- **CSP is a Unique Renewable Technology**
 - Large resource
 - Ability to store energy to fit utility need
 - Near-term potential for cost competitiveness
- **The Market is Rapidly Developing**
 - Utilities interest in CSP is growing
 - Large credible, financially stable developers
 - Real (financiable, buildable and reliable) projects are being offered
- **Policy Decisions will Maintain Momentum**
 - Long term ITC extension
 - Supporting state policies

Contact Information

Fred Morse

Chairman, CSP Division, SEIA

and

Senior Advisor, US Operations, Abengoa Solar

236 Massachusetts Avenue, NW, Suite 605

Washington, DC 20002

Tel: +1-202-543-6601

FredMorse@MorseAssociatesInc.com