SLAC NATIONAL ACCELERATOR LABORATORY

ATLAS Computing at SLAC
Future Possibilities

Richard P. Mount

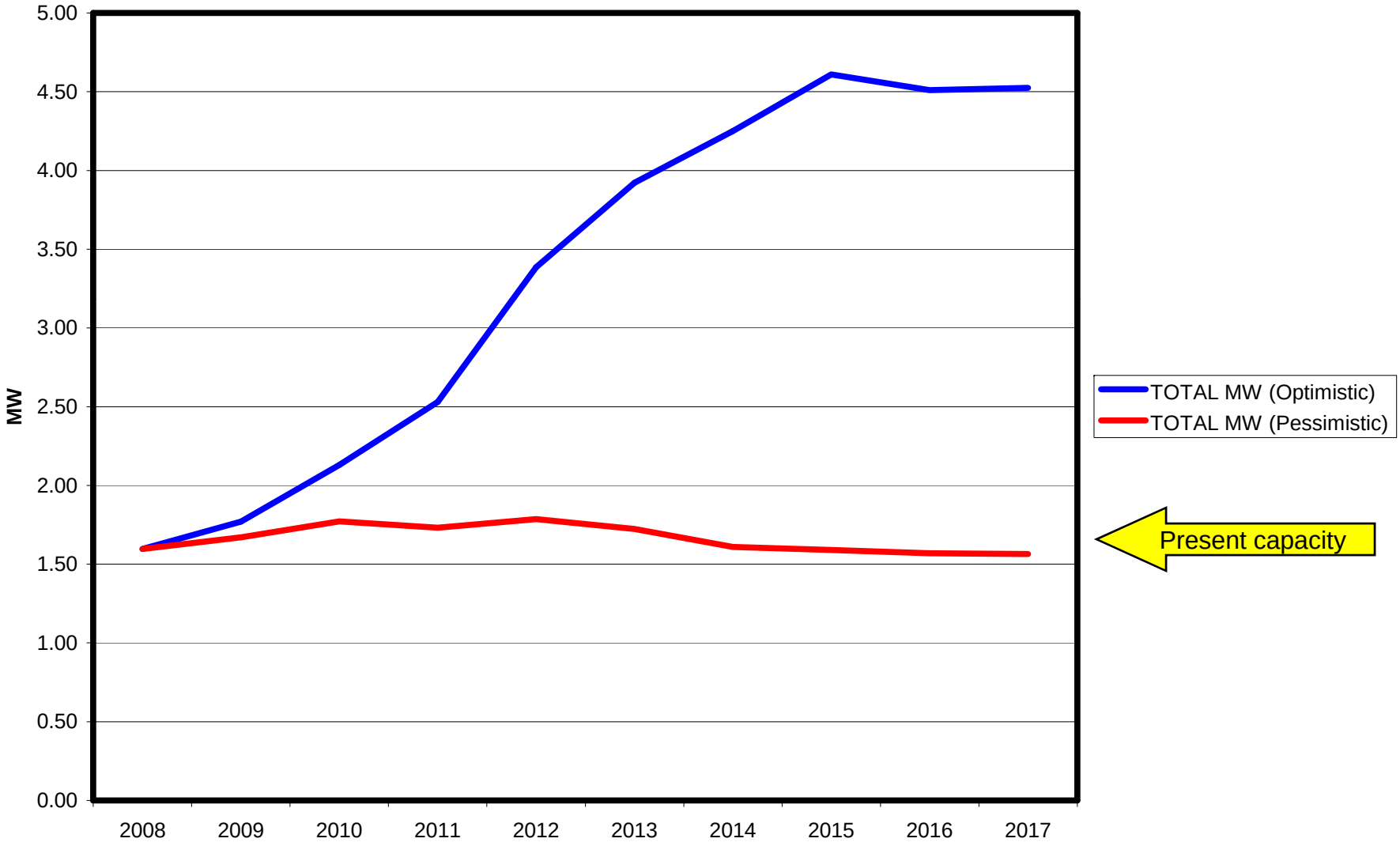
Western Tier 2 Users Forum

April 7, 2009

SLAC Computing Today

- Over 7000 batch cores (=0.6 MW)
- ~2PB of disk
- ~20 Cisco 6509s
- ~13PB of robotic tape silo slots (<4PB of data)
- ~10 Gb connections to ESNet AND to Internet 2

Long Lead Time Infrastructure Planning



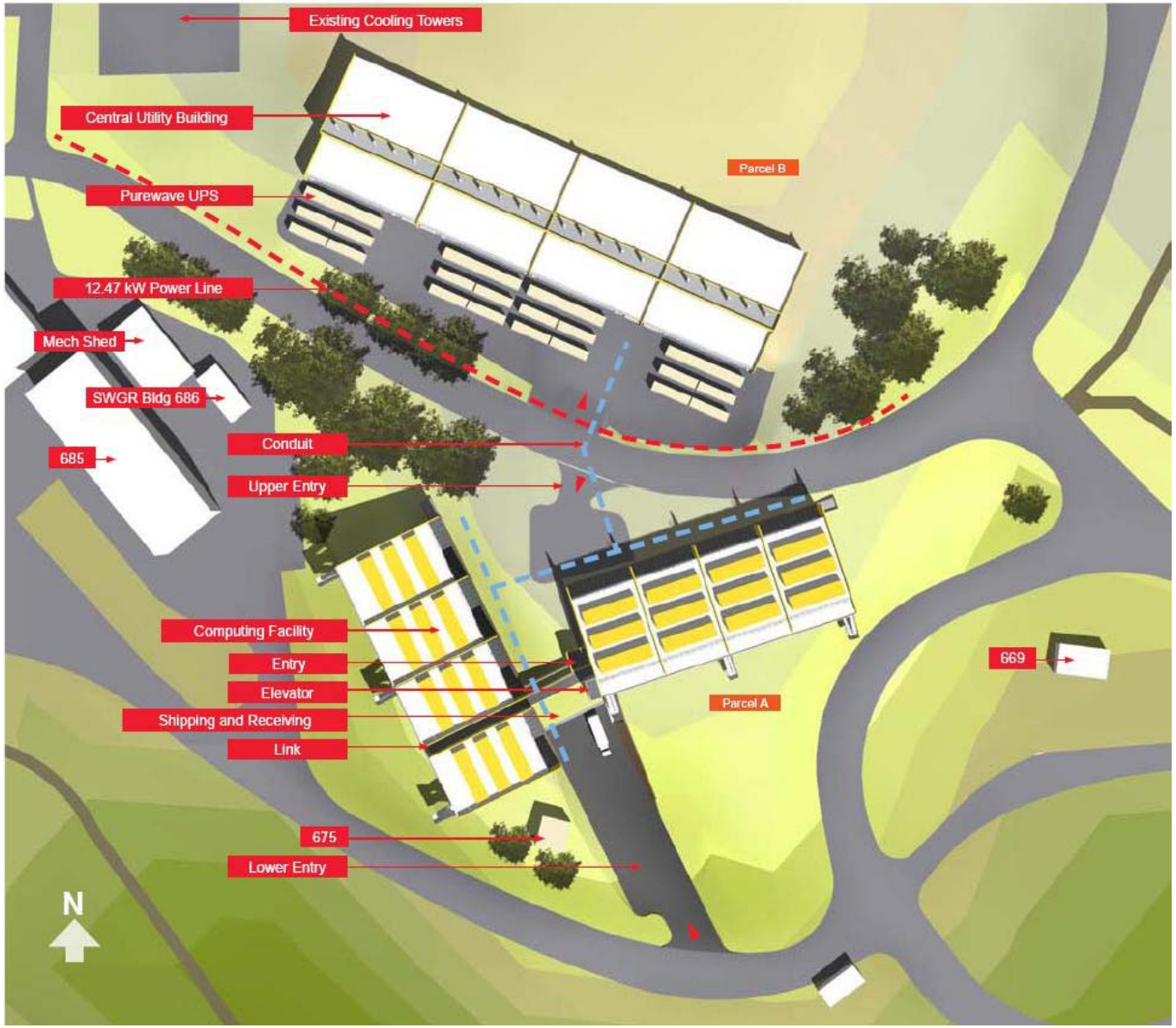
Infrastructure: The Next 3-4 Years

- Immediate issue
  - Any single component of the “optimistic” scenario takes us above our current power/cooling capacity;
  - New power/cooling requires minimum 9 months
  - 3 months notice of a new requirement is normal
- Need to plan and implement upgrades now
  - IR2 racks (up to 400 KW total) – favored
  - New BlackBox? – disfavored
  - New Water-Cooled Racks? – maybe
- Need to insist on 4-year replacement cycle

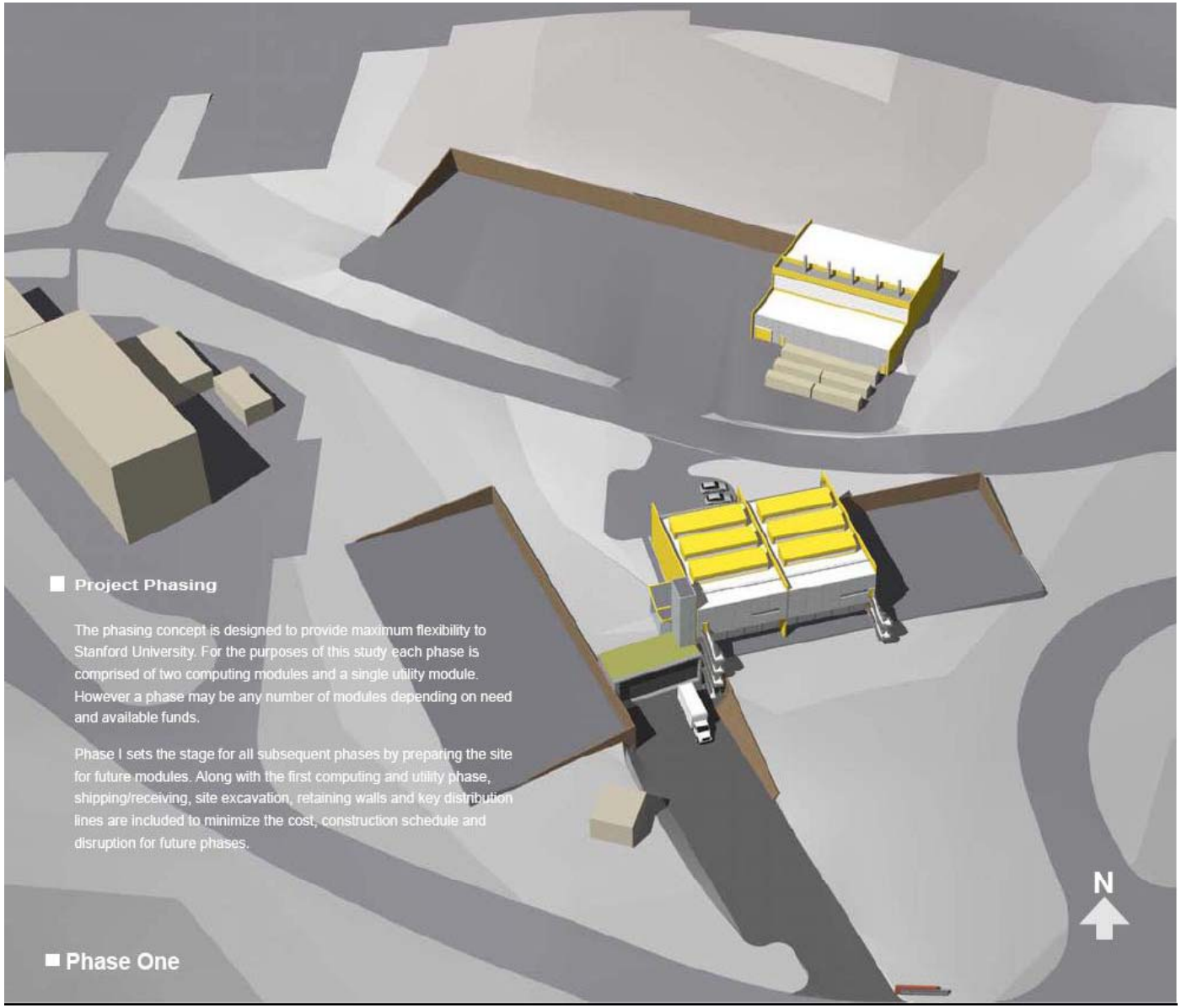
Infrastructure: 2013 on

- Proposed (Stanford) Scientific Research Computing Facility
- Modular – up to 8 modules
- Up to 3MW payload per module
- Ambient air cooled
- Cheaper than Sun BlackBoxes
- But not free! (~$10 per W capital cost)

Concept for a Stanford Research Computing Facility at SLAC (~2013)

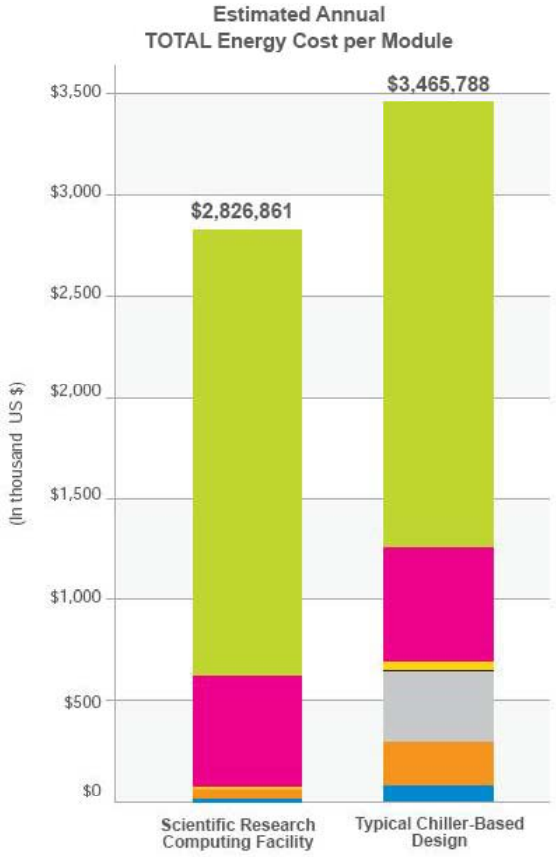


First Two Modules

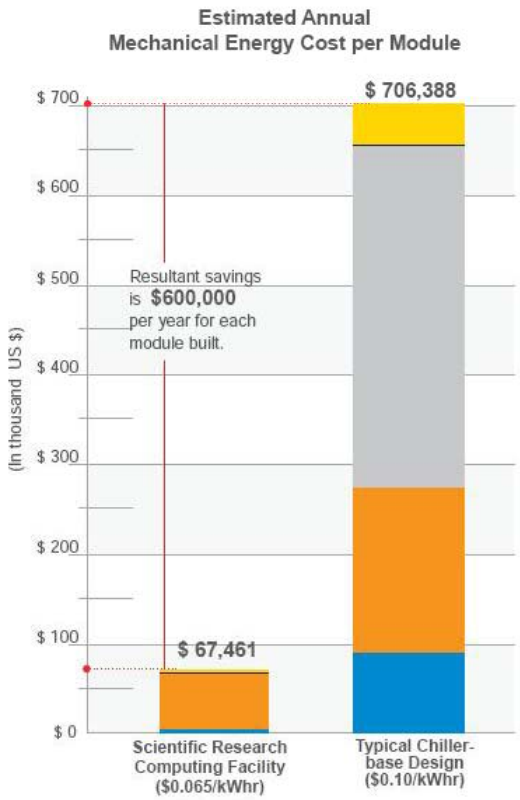


Module Detail

Green Savings



IT Load	$2,207,520	$2,207,520
Elec. Conversion	$551,880	$551,880
Cooling Tower	$3,211	$45,329
Humidification	$2,065	$48
Chiller	$0	$367,180
Fans	$59,632	$207,157
Pumps	$2,553	$86,674
Total	$2,826,861	$3,465,788



Cooling Tower	$3,211	$45,329
Humidification	$2,065	$48
Chiller	$0	$367,180
Fans	$59,632	$207,157
Pumps	$2,553	$86,674
Total	$67,461	$706,388

SLAC Computing Goals for ATLAS Computing

- Enable a major role for the "SLAC Community" in LHC physics
  - Be a source of Flexibility and Agility (fun)
  - Be among the leaders of the Revolution (fun, but dangerous)
  - Would love to provide space/power/cooling for SLAC Community equipment at zero cost, but
  - Can offer efficiency and professionalism for T3af facilities (satisfaction of a job well done)

SLAC Management Goals for SLAC Computing

- Continue to play a role in HEP computing at the level of current sum of
  - BaBar +
  - ATLAS T2 +
  - FGST (GLAST) +
  - Astro +
  - Accelerator modeling
- Maintains and develops core competence in data-intensive science

Simulation – the First Revolution?

- BaBar Computing
  - Simulation:Data Production:Analysis
    26% 31% 43% of h/w cost
  - Most simulation done at universities in return for pats on the back
  - Most Data Production and Analysis done at “Tier A” centers in return for a reduction of payments to the operating common fund
- Simulation as the dominant use of T2s seems daft
- Amazon EC2 can (probably) do simulation cheaper than a T2

SLAC as a T3af

- Costs (see following)
- Benefits:
- Pooled Batch computing (buy 10s or gores, get access to 1000s of cores)
- Storage sharing (get a fraction of a high-reliability device)
- High performance access to data
- Mass Storage
- High Availbility

Housing $1M/year in the BaBar Electronics Huts

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Equipment purchases ($k) (assumed to dissipate 0.075 W/$)	1000	1000	1000	1000	1000	1000
Cost of power installations ($k)	50	50	50	50	0	0
Cost of cooling installation ($k)	150	150	150	150	0	0
Cost of cooling and power maintenance ($K)	62.5	75	87.5	100	100	100
Cost of Power Bill ($k)	58	133	226	301	301	301
TOTAL Cooling, Power and Space costs ($k)	**320**	**408**	**514**	**601**	**401**	**401**

Personal Conclusion

- US ATLAS analysis computing:
  - will need flexibility, agility, revolution
  - seems dramatically under provisioned
- SLAC management would like to help address these issues
- These issues are my personal focus