Schatz Energy Research Center
SERC

HUMBOLDT STATE UNIVERSITY

Offshore Wind Research and Development Opportunities in the North State Region

Local Research. Global Reach.
HUMBOLDT STATE UNIVERSITY
SPONSORED PROGRAMS FOUNDATION

Presented by: Dave Carter P.E., Managing Research Engineer

California Offshore Wind Summit

March 13 2018

About the Schatz Energy Research Center (SERC)

- Started 28 years ago
- Affiliated with HSU Environmental Resources Engineering Program
- Current focus areas:
  - Smart Grids
  - Energy Access
  - Bioenergy
  - Transportation, Hydrogen, and Fuel Cells
  - Planning, Policy, and Analysis

We design and deploy clean energy technologies, and work in research, planning and policy to improve energy access around the globe.

About SERC - Partners

U.S. DEPARTMENT OF ENERGY

REC Solar

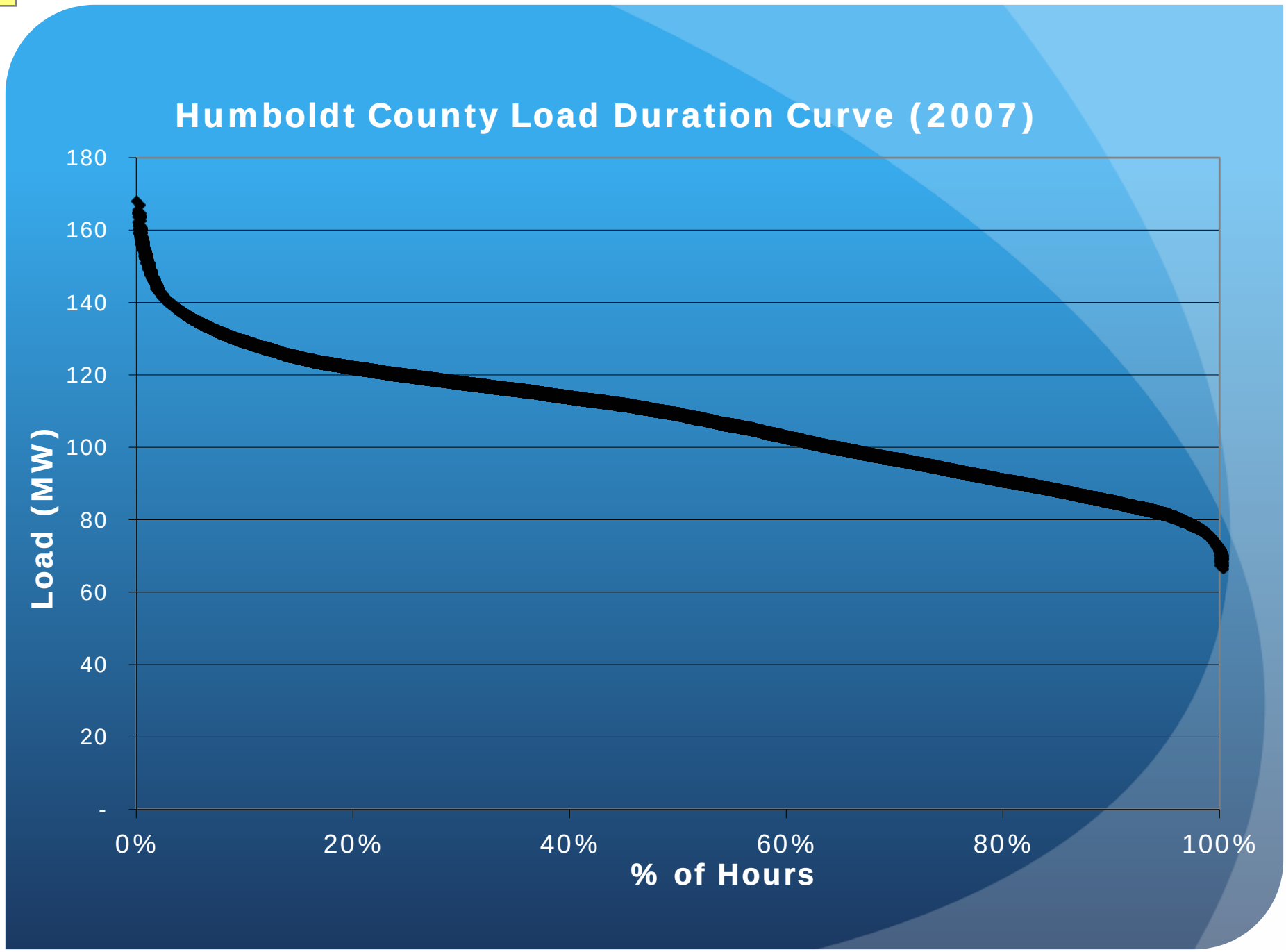
Tesla Motors

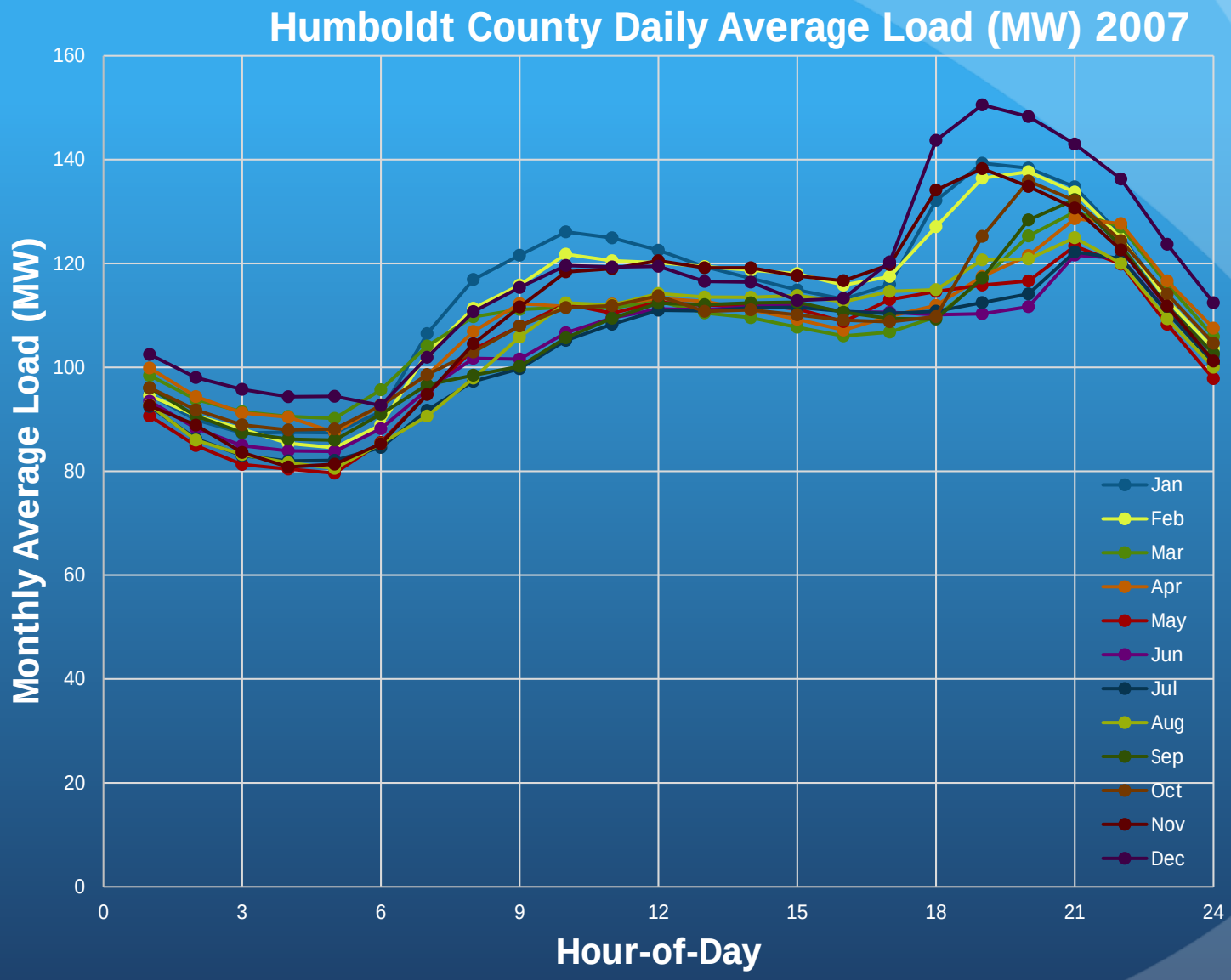
The Opportunity for Offshore Wind off the Coast of Humboldt County

- World class resource
- Port of Humboldt Bay
- RePower Humboldt
- RCEA's Community Choice Energy Program
- No known military compatibility constraints
- Design Intent of Humboldt Bay Generating Station
- Humboldt State University
  - Schatz Energy Research Center
  - Oceanography Department
  - Environmental Resources Engineering Program
  - College of Natural Resources and Sciences

Research Opportunities

- Expected energy generation profile at various scales
- Load Compatibility
- Grid Integration
- Environmental Impacts
- Port Infrastructure
- Stakeholder Perception
- Policy
- Research Lease
- Military Compatibility


Humboldt County Load Duration Curve (2007)
Load (MW)
180
160
140
120
100
80
60
40
20
-
0%
20%
40%
60%
80%
100%
% of Hours


Humboldt County Daily Average Load (MW) 2007
Monthly Average Load (MW)
160
140
120
100
80
60
40
20
0
0
3
6
9
12
15
18
21
24
Hour-of-Day
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

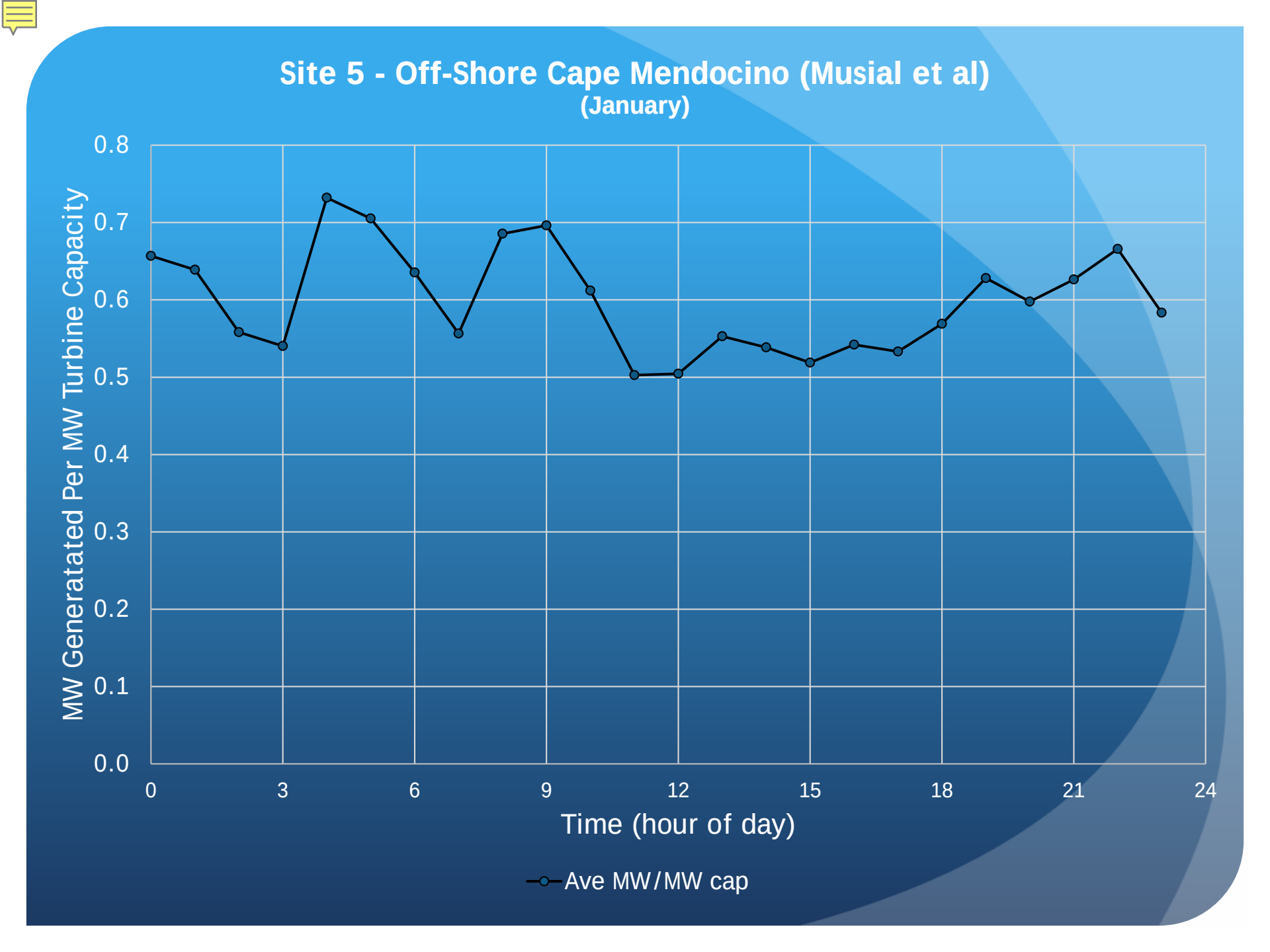
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

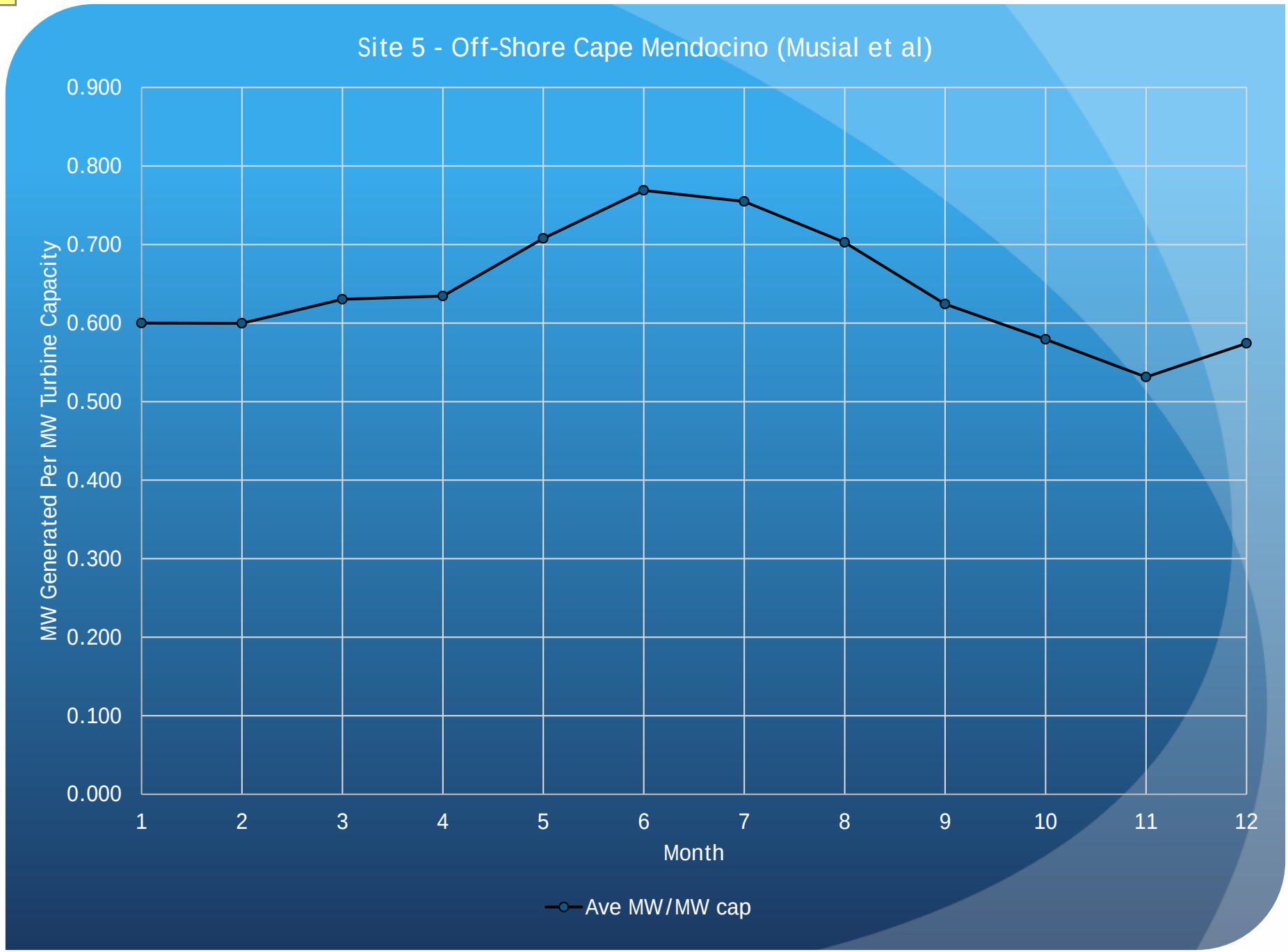
Potential Offshore Wind Energy Areas in California: An Assessment of Locations, Technology, and Costs

Walter Musial, Philipp Beiter, Suzanne Tegen, and Aaron Smith

National Renewable Energy Laboratory

BOEM
Bureau of Ocean Energy Management


Site 5 - Off-Shore Cape Mendocino (Musial et al)
(January)
MW Generatated Per MW Turbine Capacity
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
3
6
9
12
15
18
21
24
Time (hour of day)
Ave MW/MW cap


Site 5 - Off-Shore Cape Mendocino (Musial et al)
MW Generated Per MW Turbine Capacity
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
1
2
3
4
5
6
7
8
9
10
11
12
Month
Ave MW/MW cap

STATE OF CALIFORNIA
CALIFORNIA ENERGY COMMISSION

Wind Generation Summary Report 2016

Reporting Last Year

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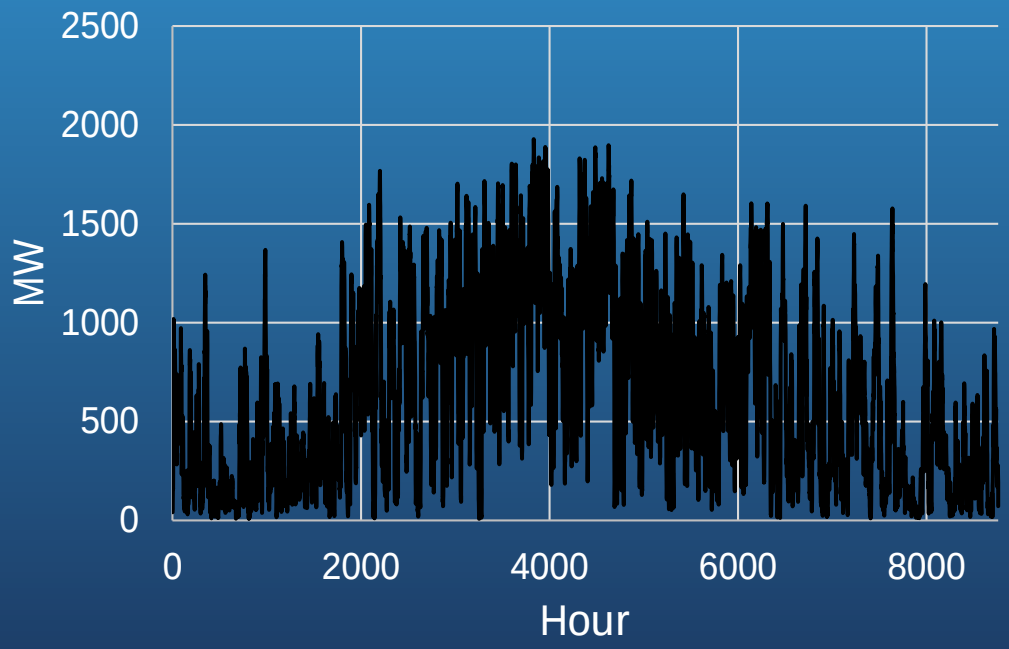
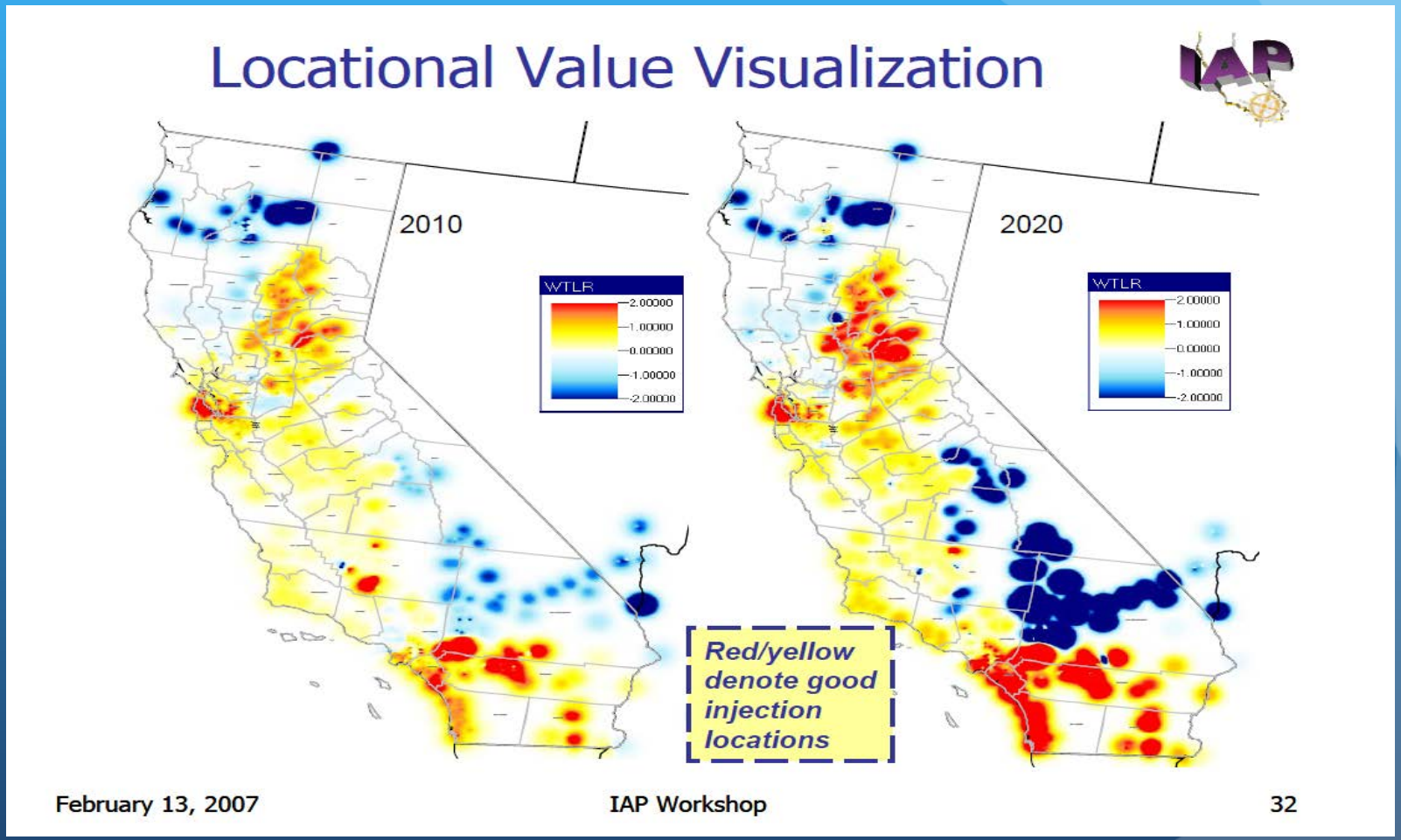
Information	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total
Cumulative Number of turbines installed (#)	7,707	7,684	7,400	7,400	-
Nameplate capacity (MW)	5,673	5,670	5,644	5,644	-
Net Capacity Factor (%)	21	37	33	18	-
Net Generation (MWh)	2,540,537	4,610,358	4,118,717	2,228,937	13,498,548



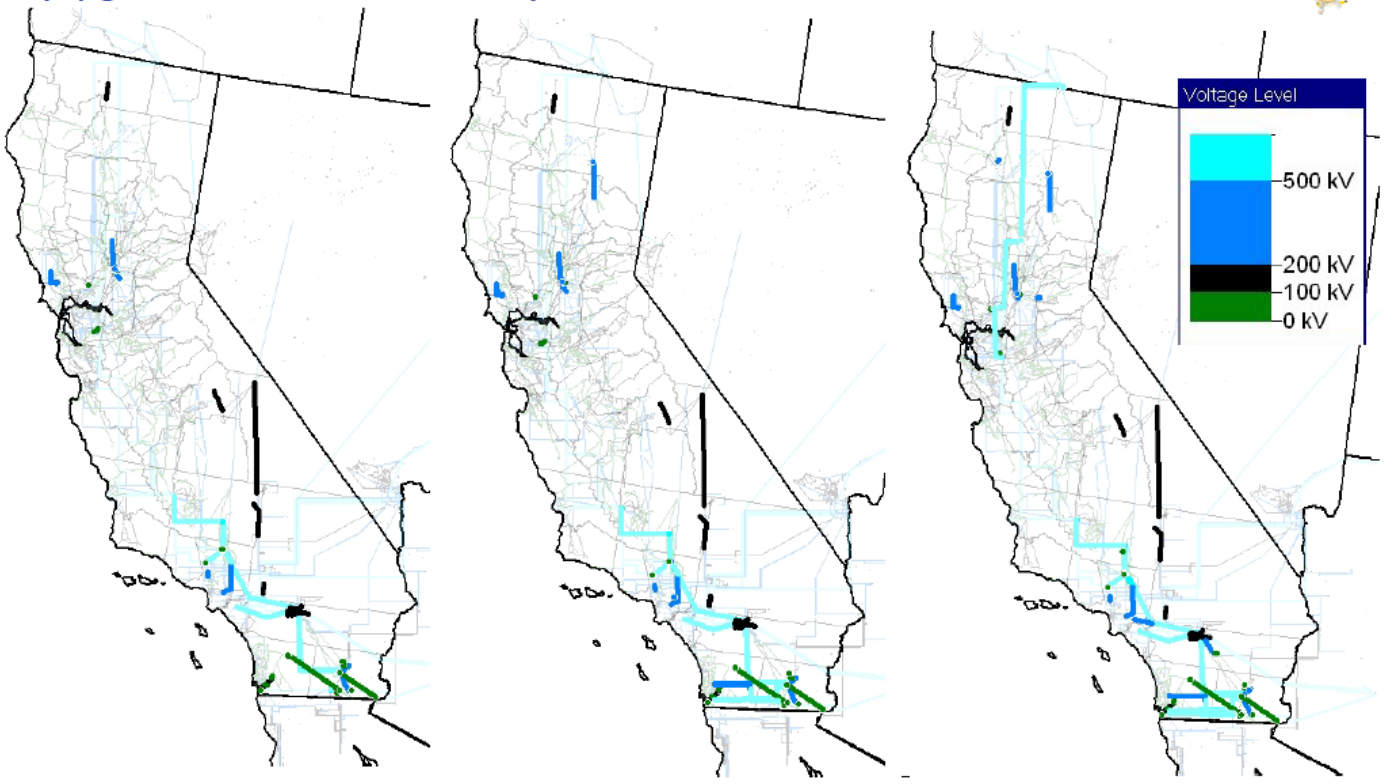
Intermittency Analysis Project 2007



Intermittency Analysis Project 2007

2010 & 2020 Transmission Expansion

(Upgrades and/or New Lines)



2010 Tehachapi | 2010 XB | 2020

Thank you

Questions?

david.carter@humboldt.edu

Schatz Energy Research Center
Humboldt State University
(707) 826-4345
www.schatzcenter.org