

OFFICE OF THE SECRETARY  
CORRESPONDENCE CONTROL TICKET

Date Printed: Feb 28, 2013 15:27

PAPER NUMBER: LTR-13-0183

LOGGING DATE: 02/28/2013

ACTION OFFICE: EDO

To: Leeds, NRE  
cys: OEDO  
RIV  
Merzke PEO

AUTHOR: Don Leichtling

AFFILIATION:

ADDRESSEE: Chairman Resource

SUBJECT: Media Alert - Chart of three modes of San Onofre Unit 2 operation, 100%, 70% and MSLB with multiple tube failures

ACTION: Appropriate

DISTRIBUTION: SECY to Ack.

LETTER DATE: 02/27/2013

ACKNOWLEDGED Yes

SPECIAL HANDLING:

NOTES:

FILE LOCATION: ADAMS

DATE DUE:

DATE SIGNED:

Template: SECY-017

ERIS: SECY-01

## Joosten, Sandy

**From:** Capt.D [captddd@gmail.com]  
**Sent:** Wednesday, February 27, 2013 7:40 PM  
**To:** Capt D  
**Subject:** Media Alert: Chart of three modes of Unit 2 operation, 100%, 70% and MSLB with multiple tube failures.

**The DAB Safety Team: February 27, 2013**

**Media Contact: Don Leichtling (619) 296-9928 or Ace Hoffman (760) 720-7261**

### Charts: San Onofre Unit 2 Modes Of Operation

**Table 1 – San Onofre RSGS Design and Operational Data**

Design and Operational Parameters which caused FEI, FIRV and MFE	U2 RSGs @100% Power	U2 RSGs @70% Power	MSLB with Multiple 8 Ruptures @600 gpm U2 RSGs @0% Power
(1) Reactor Thermal Power, MWt	1729	1215	0 (Reactor Trip)
(1A) Unit Electrical Generation, MWe	1183	?	N/A
(2) Number of Tubes	9727	9727	12,580
(3) Average Length of Heated Tubes, inches m	729.56	729.56	729.56
(4) Heat Transfer Area, ft <sup>2</sup>	116,100	116,100	116,100
(5) Tube Wall Thickness, inches	0.043	0.043	0.043
(5A) Tube Diameter, inches	0.75	0.75	0.75
(5B) Tube Pitch, inches	1.0	1.0	0.87
(5C) Tube Array	Triangular	Triangular	Triangular/Square
(5D) Tube Index	1.33-1.43	1.33 – 1.43	1.52-1.67
(5E) Tube to tube clearance, inches	0.25	0.25	?
(5F) Nominal Gap between tube and AVB", cold, inches	0.002	0.002	0.003
(5G) Nominal Gap between tube and AVB", Hot, inches	0	0	0
(5H) Nominal Gap, Manufacturing Dispersion, inches	N/A	N/A	N/A
(5I) Tube Wall Thickness/Tube Diameter Ratio	0.057	0.057	0.057
(5J) Average Heated Tube Length/Tube Diameter Ratio	973	973	973
(6) Reactor Coolant Flow (at cold leg temperature), Million lbs./hour	79.8	78.2	0 (RCS Pump Trip)
(6A) Reactor Coolant Operating Temperature (T <sub>hot</sub> ), OF	598	591	591
(6B) Reactor Coolant Operating Temperature (T <sub>cold</sub> ), OF	541	551	551
(7) RSG Operating Pressure (@100% power), psia	892	946	ATM
(8) Steam Operating Temperature (@ 0% power), OF	531	538	212
(8A) Steam Flow, Million lbs./hour	7.6	5.1	Feedwater Inventory to Environment in 5 -15* Minutes – SG Empty
(8B) Feed-water Inlet Temperature , OF	442	407	N/A
(9) Feedwater Flow, Million lbs./hour	7.6	5.1	0 (Feedwater Pumps Trip)
(10) Steam Quality, %	90%	36%	> 90%
(11) Void Fraction, %	98.5%	92.6%	100%
(11A) Maximum Gap Fluid Velocity, feet/second	25.1	12.6	> 50

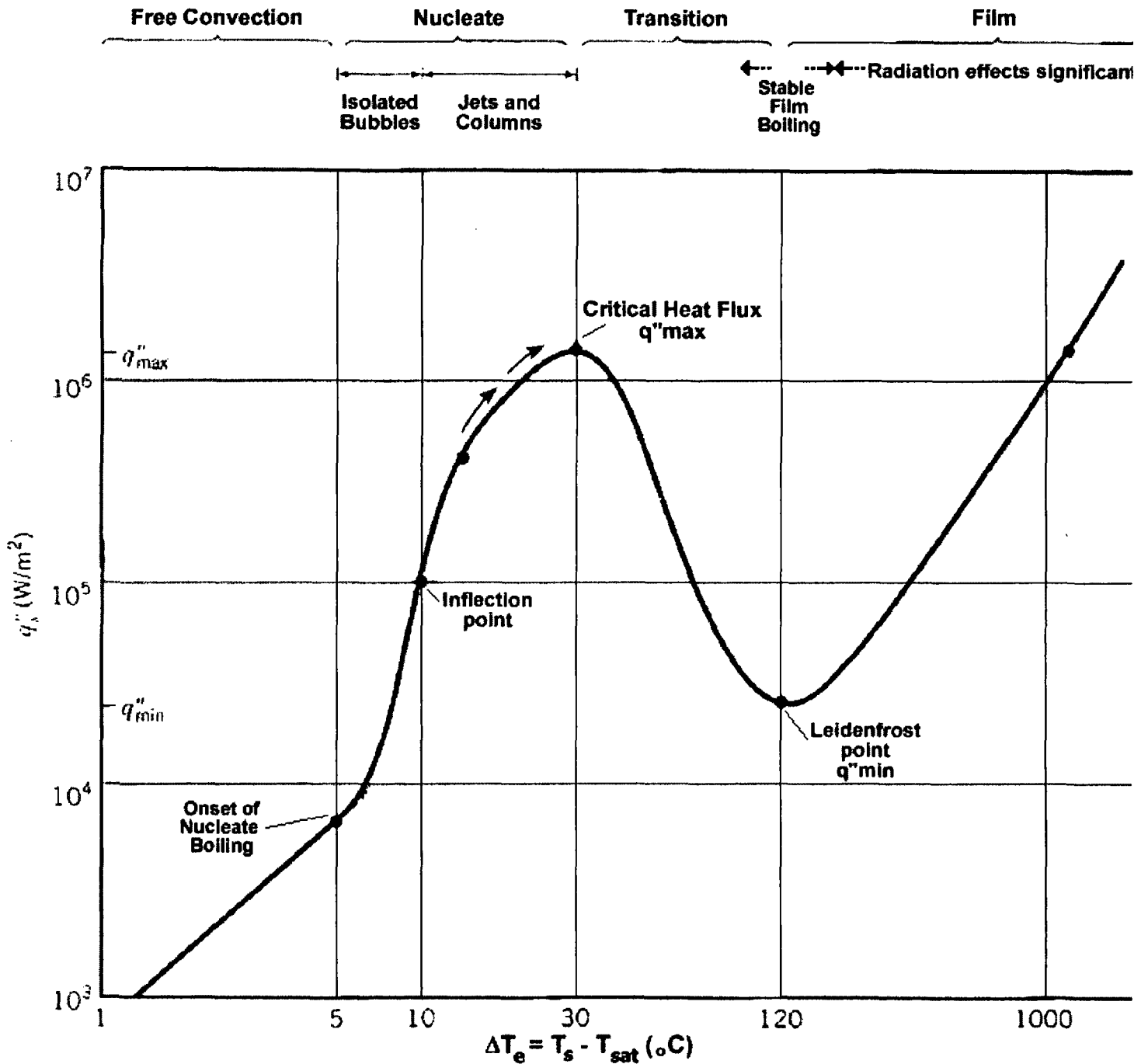
(11B) Secondary fluid density, lbm/cubic feet	7	12	< 7
(12) Reactor Coolant Volume, ft <sup>3</sup>	2003	2003	15,000 gallons RCS Tube Inventory contained in tubes escapes to the Environment in 5 -15* Minutes
(13) Circulation Ratio	3.3	4.9	0
(13A) Down-comer Feed-water Flow, Mlbs./hour	24.8	24.8	0
(14) Delta Te = (TS, 6A) – (TSAT, 7A) , OF	67	53	~400
Fluid Elastic Instability	NO	NO	YES (Film Boiling) Significant Radiation**
Flow-induced Random Vibration	YES	YES	YES
Mitsubishi Flowering Effect	YES	NO	YES
Flashing Feedwater Jet Impingement Forces on Tubes	N/A	N/A	YES

Compilation of data based on Publicly Available Documents (e.g., Westinghouse Operational Assessment, SCE Unit 3 Root cause Evaluation, [http://www.efunda.com/materials/water/steamtable\\_sat.cfm](http://www.efunda.com/materials/water/steamtable_sat.cfm), etc.)

\* No Operator Action assumed in 15 minutes

\*\* Radiation will exceed SCE FSAR limits. Offsite releases probability due to multiple tube ruptures will exceed assumed Core Damage Probability (CDP) and Large

### Boiling Regimes



**Boiling Curve for water at 1 atm.**  
 Surface heat flux  $q''$  as a function of excess temperature  $\Delta T_e = T_s - T_{\text{sat}}$

[http://en.wikipedia.org/wiki/Film\\_boiling](http://en.wikipedia.org/wiki/Film_boiling)

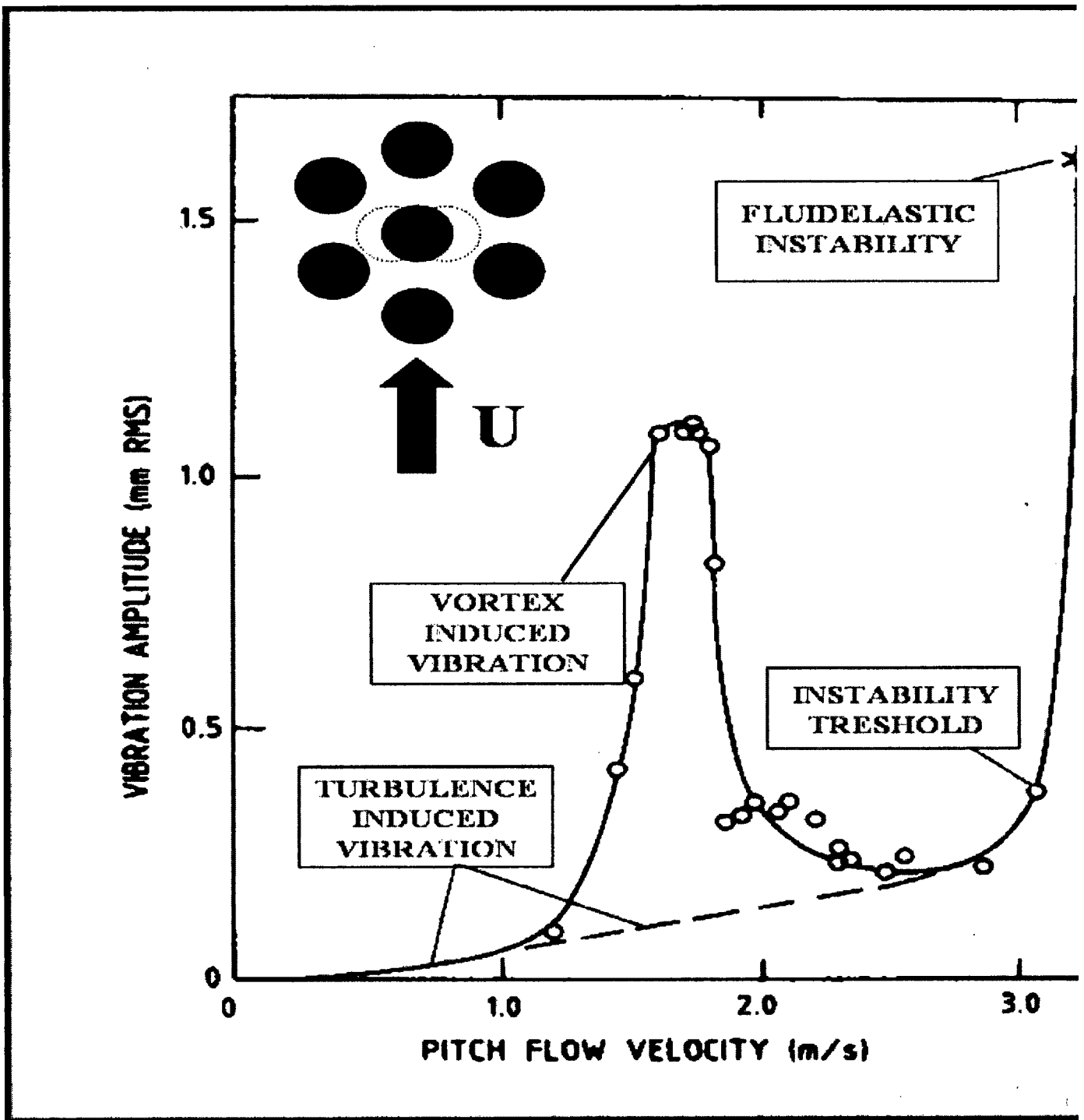


Figure 1 – Vibrations amplitude as a function of flow pitch velocity for a flexible cylinder in a rigid duct (from Pettigrew et al. 1991). The cylinder is free to vibrate in the cross-flow direction.

Reference: Violette, R., Pettigrew, M.J., Mureithi, N.W. (2006). Fluidelastic Instability of Tubes Preferentially Flexible in the Flow Direction Subjected to Two-Phase Cross Flow. of the ASME, Journal of Pressure Vessel Technology, 128(1), p. 148-159.

These charts will be posted on the web at this link: [DAB Safety Team Documents](#).

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**The DAB Safety Team:** Don, Ace and a BATTERY of safety-conscious San Onofre insiders plus industry experts from around the world who wish to remain anonymous. These volunteers assist the DAB Safety Team by sharing knowledge, opinions and insight but are not responsible for the contents of the DAB Safety Team's reports. We continue to work together as a Safety Team to prepare additional: DAB Safety Team Documents, which explain in detail why a SONGS restart is unsafe at any power level without a Full/Thorough/Transparent NRC 50.90 License Amendment and Evidentiary Public Hearings. For more information from The DAB Safety Team, please visit the link above.

**Our Mission:** To prevent a Trillion Dollar Eco-Disaster like Fukushima, from happening in the USA.

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