Fukushima Daiichi Unit 1 Accident Timeline

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
3/11	14:46	0:00	Reactor SCRAM (large earthquake acceleration)					"Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety—The Accident at TEPCO's Fukushima Nuclear Power Stations," Government of Japan, June 2011 (Japanese Government Report)	
	14:47	0:01	All CR were fully confirmed inserted					Japanese Government Report	
			Turbine trip					Japanese Government Report	
			Loss of external power supply					Japanese Government Report	
			EDG start-up					Japanese Government Report	
			MSIV close					Japanese Government Report	
	14:52	0:06	IC automatic start-up (high RPV pressure)					Japanese Government Report	
	15:03	0:17	Reactor subcriticality confirmed					"Fukushima Daiichi Nuclear Power Station, Response After the Earthquake," Summary Report of Interviews of Plant Operators (TEPCO Operators Report), 8/10 update	
	~15:03	~0:17	IC shutdown					Japanese Government Report	Excessive RPV cooldown rate
	15:07 - 15:10	0:21 - 0:24	Reactor containment spray system pumps A and B were started up to cool the suppression chamber					Japanese Government Report	
	15:17	0:31	IC(A) restarted					Japanese Government Report, Attachment IV-1	
	15:19	0:33	IC(A) stopped					Japanese Government Report, Attachment IV-1	
	15:24	0:38	IC(A) restarted					Japanese Government Report, Attachment IV-1	
	15:26	0:40	IC(A) stopped					Japanese Government Report, Attachment IV-1	
	15:27	0:41	First tsunami wave arrives					TEPCO Operators Report	
	15:32	0:46	IC(A) restarted					Japanese Government Report, Attachment IV-1	
	15:34	0:48	IC(A) stopped					Japanese Government Report, Attachment IV-1	
			During this time after earthquake and before tsunami no HPCI start, as no L-L level					Japanese Government Report	
	15:35	0:49	Second tsunami wave arrives					TEPCO Operators Report	
	15:37	0:51	All AC power supplies lost. Water level indication lost, UHS lost					Japanese Government Report	

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
			125V DC batteries flooded—no I&C					"IAEA International Fact Finding Expert Mission of the Fukushima Dai-ichi NPP Accident Following the Great East Japan Earthquake and Tsunami," (IAEA Mission Report), p. 30	15:50, according to TEPCO Operators Report
	15:42	0:56	TEPCO notification NEPA Article 10 (loss of all AC)					Japanese Government Report	
			HPCI determined to be inoperable due to loss of DC					TEPCO Operators Report	
	16:36	1:50	TEPCO notification NEPA Article 15 (loss of all ECCS) because water level cannot be confirmed					Japanese Government Report	
	16:45	1:59	Decided to cancel Article 15 notification because water level was confirmed					TEPCO Operators Report	
	17:07	2:21	Confirmation of water level lost—Article 15 notification again					TEPCO Operators Report	
	17:12	2:26	Site superintendant orders investigation of ways to inject water using fire system and fire trucks					TEPCO Operators Report, 8/10 update	
	17:30	2:44	Diesel-powered fire pump activated (standby)					TEPCO Operators Report	
	18:18	3:32	Manual opening of IC(A) supply isolation valve and return valve. Steam generation was observed, but the degree of IC function was not known.					IAEA Mission Report, p. 30	18:10, according to Japanese Government Report, Attachment IV-1. Also, if IC function was truly lost for over 2.5 hours, then core uncovery should have happened. So probably, IC was working, at least partially.
	18:25	3:39	IC(A) return valve closed					TEPCO Operators Report; and Japanese Government Report, Attachment IV-1	TEPCO Operators Report says plant operator closed the valve, but no reason is given
	20:00	5:14	Reactor pressure measurement	6.9				IAEA Mission Report, p. 31	
	20:00	5:14	HPCI determined to be inoperable due to loss of DC					TEPCO 6/16 presentation	Actually lost when tsunami hit because DC batteries are in the turbine building basement—see 15:42 item above
	20:30	5:44	MCR lighting temporarily restored					Japanese Government Report	20:49, according to TEPCO Operators Report and 8/10 report update
	21:19	6:33	Diesel fire pump lined up to add water to IC shell		200			Japanese Government Report	Level from TEPCO Operators Report
	21:23	6:37	Prime minister orders evacuation from within 3 km of Unit 1					Nuclear and Industrial Safety Agency, "Seismic Damage Information (the 81st release) (As of 16:00 April 8th, 2011)" (NISA Release #81)	
	21:30	6:44	IC(A) return valve manually opened; steam generation observed					Japanese Government Report	3 hours with no IC? Core should have melted. Maybe too little, too late.
	21:35	6:49	Diesel fire pump injecting water to IC shell					Japanese Government Report	
	21:51	7:05	High radiation level in reactor building: 290 mSv/hour					TEPCO Operators Report	

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
	22:00	7:14	RPV water level TAF +550 mm		550			TEPCO Operators Report	If this were so, then no radiation should have been observed, so reading is suspect. High DW temperature may give false high reading.
	23:00	8:14	Radiation rising in TB					Japanese Government Report	
3/12	0:30	9:44	Water being supplied to IC(A) shell side					Japanese Government Report	
	0:49	10:03	Possibility that DW pressure exceeded 600 kPa. TEPCO determined NEPA Article 15 (abnormal rise in containment vessel pressure occurred).				0.6	Japanese Government Report	It should have taken 20 hours to get to this pressure, unless a large amount of H_2 was generated. "Additional Report of the Japanese Government to the IAEA," September 2011 (Additional Japanese Government Report) says this was done by 23:50, 3/11; TEPCO Operators Report 8/10 update says 0:06, 3/12. Site superintendent orders preparations for venting.
	1:30	10:44	Proposed to government and obtained agreement to vent					TEPCO Operators Report	
	1:48	11:02	D/D FP trouble, shutdown					Japanese Government Report; and TEPCO Operators Report	
	2:30	11:44	DW pressure 840 kPa, RPV level 1300/530; RPV pressure ~840 kPa	0.84	900?		0.84	Japanese Government Report; and INPO 11-005 (for RPV pressure)	Suspect level. High DW temp; reference leg may have boiled. If RPV pressure = PCV pressure, then PCV pressure must be reduced to allow fire pump injection.
	2:45	11:59	Reactor pressure read using car batteries	0.8				IAEA Mission Report, p. 31	No mention of how RPV was depressurized, so pressure boundary may have been compromised
	3:58	13:12	A large aftershock was felt at the plant					TEPCO press release, March 12, 2011, 4AM update	
	4:15	13:29	DW pressure 840 kPa				0.84	Japanese Government Report	
	5:09	14:23	DW pressure 770 kPa				0.77	Japanese Government Report	Possibility of leak according to text
	5:14	14:28	Site radiation level rising and DW pressure decreasing					Japanese Government Report	
	5:44	14:58	Prime minister orders evacuation from within 10 km of Unit 1					NISA Release #81	
	5:46	15:00	Truck FP injection of freshwater to RPV					IAEA Mission Report, p. 31; and TEPCO Operators Report, 8/10 update	
	5:52	15:06	1 m^3 (~250 gal) water injected via CS line					TEPCO Operators Report, 8/10 update	
	6:30	15:44	2 m^3 (~500 gal) water injected via CS line					Japanese Government Report	
	6:50	16:04	Ministry order to implement vent					TEPCO Operators Report	
	7:11	16:25	Prime minister arrives at site					TEPCO Operators Report, 8/10 update	
	7:55	17:09	RPV level near TAF, 3 m^3 (~800 gal) injected		-100			Japanese Government Report	
	8:04	17:18	Prime minister departs site					TEPCO Operators Report, 8/10 update	Not mentioned in 1F1 timeline, but in 1F2 timeline

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
	8:15	17:29	4 m^3 (~1050 gal) water injected via CS line					TEPCO Operators Report, 8/10 update	
	8:30	17:44	5 m^3 (~1300 gal) water injected via CS line					Japanese Government Report	
	9:03	18:17	Evacuation of Okuma town confirmed					Additional Japanese Government Report, pg 6	
	9:04	18:18	Start of attempt to vent					Japanese Government Report	
	9:15	18:29	6 m^3 (~1600 gal) water injected via CS line					Japanese Government Report	Average rate 7 gpm. Need 56 gpm to keep up with decay heat. Must be near shutoff head of fire pumps.
	~9:15	~18:29	SC vent MO valve opened 25%					Japanese Government Report	Per procedure. 25% open should be enough. 9:24, according to TEPCO Operators Report.
	~9:30	~18:44	SC second AO valve open attempt stopped due to high radiation					Japanese Government Report	
	9:40	18:54	21 m^3 (~5550 gal) water injected					Japanese Government Report	Rate up to 160 gpm
	10:17	19:31	SC second AO valve open attempt from control room					Japanese Government Report	This attempt seems to have been successful
	10:40	19:54	As radiation level at main gate increased, judged that vent was working					TEPCO Operators Report	
	11:15	20:29	Radiation levels falling, so venting may have stopped					TEPCO Operators Report, 8/10 update	
	12:55	22:09	RPV level -1700/-1500; DW pressure 750 kPa		-1600		0.75	Japanese Government Report	How can DW pressure stay at ~0.8 MPa for an additional 10 hours after first getting there? There has to be a leak.
	~14:00	~23:14	Additional local attempt to open second AO valve					Japanese Government Report	Using compressor, per Additional Japanese Government Report
	14:30	23:44	Operators confirmed decrease in DW pressure					IAEA Mission Report, p. 32; and TEPCO Operators Report	
	14:50	24:04	DW pressure 0.58 MPa				0.58	TEPCO Operators Report	
	14:53	24:07	80 m^3 (~21,000 gal) water injected. Freshwater ran out.					Japanese Government Report	Average 46 gpm
	15:18-15:36	24:32-24:50	Working on restoration of SLCS to pump water, using truck power supply					TEPCO Operators Report, 8/10 update	
	15:36	24:50	Aftershock					TEPCO press release, March 12, 2011, 5PM update	
	~15:36	~24:50	Hydrogen explosion[1]					IAEA Mission Report, p. 32	Coincidence, or cause of explosion?
	16:17	25:31	Article 15 : radiation levels at the site boundary exceed limits					TEPCO press release: "Occurrence of a Specific Incident Stipulated in Article 15, Clause 1 of the Act on Special Measures Concerning Nuclear Emergency Preparedness (Extraordinary increase of radiation dose at	16:27, according to TEPCO Operators Report 8/10 update

[1] As used in this timeline, the term "explosion" could mean either a "deflagration" or a "detonation." Which of these rapid hydrogen combustion events actually took place is still under study.

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
								site boundary),” March 12, 2011	
	18:25	27:39	Prime minister orders evacuation from within 20 km of Fukushima Daiichi NPS					NISA Release #81	
	17:20-18:30	26:34-27:44	Investigating the condition of fire trucks, SLCS power supply, hoses, etc., and found unusable due to explosion					TEPCO Operators Report, 8/10 update	
	19:04	28:18	Injection of seawater by fire trucks started					Japanese Government Report	
	20:45	29:59	Injection of boric acid mixed with seawater started					Japanese Government Report	
3/13	3:38	36:52	Injection of seawater via fire line					Japanese Government Report	

Fukushima Daiichi Unit 2 Accident Timeline

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
3/11	14:47	0:00	Reactor SCRAM (large earthquake acceleration)					"Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety—The Accident at TEPCO's Fukushima Nuclear Power Stations," Government of Japan, June 2011 (Japanese Government Report)	
			All CR were fully confirmed inserted					Japanese Government Report	
			Turbine trip					Japanese Government Report	
			Loss of external power supply					Japanese Government Report	
			EDG start-up					Japanese Government Report	
			MSIV close					Japanese Government Report	
	14:50	0:03	RCIC was manually started up					Japanese Government Report	
	14:51	0:04	RCIC high RPV level trip (L-8)					Japanese Government Report	
	15:00	0:13	RHR pumps started up for SP cooling					Japanese Government Report	
	15:01	0:14	Reactor subcriticality confirmed					"Fukushima Daiichi Nuclear Power Station, Response After the Earthquake," Summary Report of Interviews of Plant Operators (TEPCO Operators Report), 8/10 update	
	15:02	0:15	RCIC was manually started up					Japanese Government Report	
	15:07	0:20	RHR pumps were ended sequentially					Japanese Government Report	Some confusion between table and text. Text says RHR pumps ran until tsunami arrived.
	15:27	0:40	First tsunami wave arrives					TEPCO Operators Report	
	15:28	0:41	RCIC trip (L-8)					Japanese Government Report	
	15:31	0:44	HPCI seems to be inoperable due to loss of DC					TEPCO 6/16 presentation	Timing? The tsunami must have arrived first.
	15:35	0:48	Second tsunami wave arrives					TEPCO Operators Report	
	15:39	0:52	RCIC was manually started up					Japanese Government Report	
	15:41	0:54	All AC power supplies lost					Japanese Government Report	I&C lost also, meaning DC bus also failed
	15:42	0:55	TEPCO notification NEPA Article 10 (loss of all AC)					Japanese Government Report	
	16:36	1:49	TEPCO notification NEPA Article 15 (loss of all ECCS)					Japanese Government Report	
	17:12	2:25	Start of planning for water injection via fire pump. RHR valves aligned to permit low-pressure injection to RPV when RPV depressurized.					TEPCO Operators Report	

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
	20:30	5:43	RCIC under shutdown					Japanese Government Report	Some conflict in sources. According to "IAEA International Fact Finding Expert Mission of the Fukushima Dai-ichi NPP Accident Following the Great East Japan Earthquake and Tsunami" p. 31, the RCIC ran continuously for 3 days although status could not be confirmed in the control room. Unless RCIC operation was made manual, it should have tripped several times due to high water level and restarted at low water level.
			MCR lighting temporarily restored					Japanese Government Report	20:49, according to TEPCO Operators Report
	21:02	6:15	Reported risk of water level reaching TAF because of uncertainty in water level					TEPCO Operators Report	
	21:23	6:36	Prime minister orders evacuation from within 3 km of Unit 1					Nuclear and Industrial Safety Agency, "Seismic Damage Information (the 81st release) (As of 16:00 April 8th, 2011)" (NISA Release #81); and TEPCO Operators Report, 8/10 update	
	22:00	7:13	RPV water level TAF +3400 mm		3400			Japanese Government Report	21:50, according to TEPCO Operators Report, 8/10 update
	22:47	8:00	RCIC operation cannot be confirmed					Japanese Government Report	Confusion—see comment at 20:30, above
	23:25	8:38	RPV pressure 6.3 MPa	6.3				Japanese Government Report	
	23:55	9:08	Drywell pressure 40 kPa				0.14	Japanese Government Report	After 9 hours of isolation? Must be a leak. Must mean 40 kPag.
3/12	0:00	9:13	RPV water level at 3500 mm		3500			Japanese Government Report	
	0:30	9:43	RCIC under shutdown				0.14	Japanese Government Report	Confusion—see comment at 20:30, 3/11, above
	1:30	10:43	Proposed to government and obtained agreement to vent					TEPCO Operators Report	
	2:55	12:08	RCIC start-up state was checked					Japanese Government Report	Found operational per TEPCO Operators Report
	3:00	12:13	Evacuation ordered for 3-km radius from plant					TEPCO press release, March 12, 2011, 3AM update	
	3:58	13:11	A large aftershock was felt at the plant					TEPCO press release, March 12, 2011, 4AM update	
	4:20 - 5:00	13:33 - 14:13	RCIC water supply was switched from CST to SC					Japanese Government Report	To avoid high water level in SP, according to text
	4:55	14:08	Rise in radiation level within station grounds					TEPCO Operators Report, 8/10 update	The 1F1 timeline says 05:14
	5:44	14:57	Prime minister orders evacuation from within 10 km of Unit 1					NISA Release #81	
	6:50	16:03	Ministry order to implement vent					TEPCO Operators Report	
	7:11	16:24	Prime minister arrives at site					TEPCO Operators Report, 8/10 update	

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
	8:04	17:17	Prime minister departs site					TEPCO Operators Report, 8/10 update	
	15:36	24:49	Aftershock					TEPCO press release, March 12, 2011, 5PM update	
	16:17	25:30	Article 15 : radiation levels at the site boundary exceed limits					TEPCO press release: "Occurrence of a Specific Incident Stipulated in Article 15, Clause 1 of the Act on Special Measures Concerning Nuclear Emergency Preparedness (Extraordinary increase of radiation dose at site boundary)," March 12, 2011	16:27, according to TEPCO Operators Report, 8/10 update
	17:30	26:43	Station general manager orders venting preparation				0.2	TEPCO Operators Report	
	18:25	27:38	Prime minister orders evacuation from within 20 km of Fukushima Daiichi NPS					NISA Release #81	
3/13	3:00	36:13	DW pressure rises to 315 kPa				0.315	Japanese Government Report	Hard to believe it takes 36 hours to get containment to this pressure if it is the only heat sink, unless there is already a leak in the containment boundary
	8:10	41:23	PCV vent valve (MOV) opened 25%					TEPCO Operators Report	
	8:56, and again at 14:23 on 3/13 and at 4:24, 5:37, 8:00, and 9:34 on 3/14	42:09	Article 15 : radiation levels at the site boundary exceed limits					TEPCO Operators Report.	Times reported by NISA Release #81 are a little different
	11:00	44:13	Second valve set to "open" for venting					Japanese Government Report	No venting will occur until rupture disk setpoint of 0.549 MPa is reached. Note that this is above the design pressure of the PCV (0.53 MPa).
	12:05	45:18	Plant general manager orders preparation for seawater injection					TEPCO Operators Report	
3/14	11:01	68:14	Could not confirm that the SC side valve was open. Prepared water injection line not available.					Japanese Government Report	Due to explosion in Unit 3, per TEPCO Operators Report
	>11:00	>68:13	Blowout panel in RB opened by explosion in Unit 3					NISA Release #81	
	12:00	69:13	SC temperature 147ºC and SC pressure 485 kPa and increasing. Water level decreasing.		3400	147	0.485	Japanese Government Report	Text also says RCIC was running at this time
	12:30	69:43	RPV level 2950 mm (A), 3000 mm (B)		2950			Japanese Government Report	
	13:05	70:18	Reconfigured seawater injection line, including fire truck					TEPCO Operators Report, 8/10 update	
	13:25	70:38	RCIC shutdown (assumed)					Japanese Government Report	Must be, as RPV level is decreasing, per TEPCO Operators Report, 8/10 update

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
			TEPCO notification NEPA Article 15 (loss of reactor cooling)					Japanese Government Report	
	15:00	72:13	RCIC operation state was being checked					Japanese Government Report	
	15:28	72:41	Authorities notified that TAF expected by 16:30					TEPCO Operators Report, 8/10 update	
	16:00	73:13	Started operation to open SC side valve		300			Japanese Government Report; and INPO 11-005 (for RPV water level)	
	16:20	73:33	Confirmed that the SC side valve was closed					Japanese Government Report	
	16:34	73:47	Depressurization of RPV was started using SRV, and seawater injection was started using fire engine lines					Japanese Government Report	
	17:17	74:30	Water level reached TAF		0			Japanese Government Report	Text says 16:20, and this is more consistent with boiloff rate
	~18:00	~75:13	Reactor pressure decrease was observed. Problems with air pressure for SRV and excitation of the admitting solenoid, so SRV seemed to be closed, as RPV pressure increased.	5.4				Japanese Government Report	This is a key problem. Inability to depressurize the RPV is why no low-pressure water can be added.
	18:22	75:35	RPV level is TAF -3700 (BAF)		-3700			Japanese Government Report	5 hours to boil off water to BAF consistent with no makeup
	19:03	76:16	RPV pressure	0.63				Japanese Government Report	
	19:20	76:33	Fire pumps for seawater injection stopped due to lack of fuel					Japanese Government Report	
	19:54	77:07	Seawater injection started—first fire pump started up					Japanese Government Report	No injection is going to occur until RPV pressure is low
	19:57	77:10	Second fire pump started up					Japanese Government Report	
	21:00	78:13	Operation of opening SC side small valve success unknown				0.42	Japanese Government Report; and INPO 11-005 (for containment pressure)	TEPCO Operators Report says it worked, but rupture disk pressure not reached.
	21:03	78:16	RPV pressure decreased	1.418				Japanese Government Report	Must mean relative to rated pressure—already reported as 0.63 MPa at 19:03. This is above head of fire pumps.
	21:20	78:33	By opening 2 SRV, RPV depressurization and water level restoration were confirmed. Thereafter, due to problems including air pressure for driving SRV and maintaining excitation of solenoid valve controlling air supply, the opening and closing operation of SRV seemed to be performed.					Japanese Government Report	From Figure IV-5-5, when RPV pressure spikes up to 3 MPa, fire pumps cannot add water
	~21:20	~78:33	It was observed that RPV water level tended to recover		-3000			Japanese Government Report	

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
	22:14	79:27	Reactor water level recovered to -1800 mm. Core damage thought to be 5% or less		-1800			Japanese Government Report	
	22:50	80:03	DW pressure exceeded design pressure. Operator determined NEPA Article 15 event (abnormal increase in containment pressure).				0.54	Japanese Government Report	There is no way containment can last 80 hours as a heat sink unless some venting is occurring
	23:35	80:48	Decide to open small DW vent path, since DW pressure higher than WW pressure					TEPCO Operators Report	
	23:44	80:57	Measurements				0.75	INPO 11-005	Drywell pressure
3/15	0:00	81:13	CAMS reading went up by 3 to 4 orders of magnitude					Japanese Government Report	Means fuel is melting
	0:02	81:15	Valve set to open for drywell venting					Japanese Government Report	
	0:45	81:58	Reactor pressure at 1823 kPa	1.823				Japanese Government Report	
	3:00	84:13	DW pressure at 750 kPa				0.75	Japanese Government Report	
			Since DW pressure exceeded design pressure, RPV depressurization was begun to allow injection into the reactor, but RPV not sufficiently depressurized					Japanese Government Report	With high PCV pressure, not possible to depressurize RPV fully; 0.5 MPa PCV pressure will only allow RPV to depressurize to 3 MPa (430 psia) with some SRV designs
	5:00	86:13	RPV pressure decreased	0.626				Japanese Government Report	
	~6:00 - 6:10	~87:13 - 87:23	Explosion,[2] thought to be hydrogen, came from near the SC. All personnel evacuated except those necessary for operation. SC pressure unknown.	unknown	-2800		0.73	Japanese Government Report	There are second thoughts about whether it was a hydrogen explosion. (Source: "No explosion at No. 2 reactor. TEPCO: Only 3 hydrogen blasts occurred at Fukushima N-plant," *Daily Yomiuri*, October 3, 2011.) Also, hydrogen not mentioned in TEPCO Operators report, 8/10 update. Maybe the containment leak is at this location.
	7:00, and again at 8:36, 16:22, and 23:20 on 3/15	88:13	Article 15 : radiation levels at the site boundary exceed limits					TEPCO Operators Report	Times reported by NISA Release #81 are a little different
	8:25	89:38	White smoke (seemed to be steam) observed near the fifth floor of RB					Japanese Government Report	
	11:00	92:13	Prime minister directs indoor refuge for people living within 20 to 30 km from the site					TEPCO Operators Report, 8/10 update	
	15:25	96:38	Reactor pressure lower than DW pressure	0.119			0.174	Japanese Government Report	Means no leak in RPV boundary?
	15:30	96:43	Core damage estimate changed from14% to 35%					Japanese Government Report	

[2] As used in this timeline, the term "explosion" could mean either a "deflagration" or a "detonation." Which of these rapid hydrogen combustion events actually took place is still under study.

Fukushima Daiichi Unit 3 Accident Timeline

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
3/11	14:47	0:00	Reactor SCRAM (large earthquake acceleration)					"Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety—The Accident at TEPCO's Fukushima Nuclear Power Stations," Government of Japan, June 2011 (Japanese Government Report)	
			All CR were fully confirmed inserted					Japanese Government Report	
			Turbine trip					Japanese Government Report	
			Loss of external power supply					Japanese Government Report	
	14:48	0:01	EDG start-up					Japanese Government Report	
			MSIV close					Japanese Government Report	
	14:52	0:05	SRV repeated opened and closed from this point on					Japanese Government Report	Typical for controlling pressure
	14:54	0:07	Reactor subcriticality confirmed					"Fukushima Daiichi Nuclear Power Station, Response After the Earthquake," Summary Report of Interviews of Plant Operators (TEPCO Operators Report), 8/10 update	
	15:05	0:18	RCIC was manually started up					Japanese Government Report	
	15:25	0:38	RCIC high RPV level trip (L-8)					Japanese Government Report	Text says 15:28
	15:27	0:40	First tsunami wave arrives					TEPCO Operators Report	
	15:35	0:48	Second tsunami wave arrives					TEPCO Operators Report	
	15:38	0:51	All AC power supplies lost					Japanese Government Report	DC bus escaped flooding
	15:42	0:55	TEPCO notification NEPA Article 10 (loss of all AC)					Japanese Government Report	
	16:03	1:16	RCIC manually turned on					Japanese Government Report	Text says it came on due to low level, but Operators Report also says manually started
	20:30	5:43	RCIC in operation					Japanese Government Report	
			MCR lighting temporarily restored					Japanese Government Report	21:58, according to TEPCO Operators Report
	21:23	6:36	Prime minister orders evacuation from within 3 km of Unit 1					Nuclear and Industrial Safety Agency, "Seismic Damage Information (the 81st release) (As of 16:00 April 8th, 2011)" (NISA Release #81)	
	22:35	7:48	RPV water level decreasing					Japanese Government Report	
	22:58	8:11	RPV water level measurement		350			Japanese Government Report	Seems low with RCIC running. INPO 11-005 says water level was maintained by RCIC at around +4000 mm. This may be a relative

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
									number, not corrected to level above TAF.
3/12	3:00	12:13	Evacuation ordered for 3-km radius from plant					TEPCO News Release #6	
	3:58	13:11	A large aftershock was felt at the plant					TEPCO News Release #8	
	4:55	14:08	Rise in radiation level within station grounds					TEPCO Operators Report, 8/10 update	The 1F1 timeline says 05:14
	5:44	14:57	Prime minister orders evacuation from within 10 km of Unit 1					NISA Release #81	
	11:36	20:49	RCIC stopped					Japanese Government Report	Unless flow was controlled, RCIC should have come on and off several times. Batteries may have been exhausted.
	12:10	21:23	Reactor pressure measurement	7.53				Japanese Government Report	
	12:35	21:48	HPCI turned on at L-2		~3000			Japanese Government Report	
	12:45	21:58	Reactor pressure decreasing	5.6				Japanese Government Report	
	15:36	24:49	Aftershock					TEPCO press release, March 12, 2011, 5PM update	
	16:17	25:30	Article 15 : radiation levels at the site boundary exceed limits					TEPCO press release: "Occurrence of a Specific Incident Stipulated in Article 15, Clause 1 of the Act on Special Measures Concerning Nuclear Emergency Preparedness (Extraordinary increase of radiation dose at site boundary)," March 12, 2011	
	16:35	25:48	Measurements		+4570			INPO 11-005	
	17:00	26:13	Measurements	3.0				INPO 11-005	Corrected for absolute pressure
	17:30	26:43	Station general manager orders venting preparation					TEPCO Operators Report	
	18:25	27:38	Prime minister orders evacuation from within 20 km of Fukushima Daiichi NPS					NISA Release #81	
	20:15	29:28	Reactor pressure decreasing	0.8				Japanese Government Report	
3/13	2:42	35:55	HPCI stopped	0.68				Japanese Government Report; and INPO 11-005 (for RPV pressure)	Most likely due to low RPV pressure. Batteries probably exhausted anyway. HPCI ran continuously since 12:35, 3/12, by using min flow line and throttle of water to RPV to maintain level. RPV pressure significantly decreased during HPCI operation. (Source: "Factors of Fluctuation in Plant Parameters such as Reduction of the Pressure in Reactor During Operation of High Pressure Coolant Injection System," TEPCO memo, July 28, 2011.)

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
	3:51	37:04	Power restored to level gauge		-1600			Japanese Government Report	Suspect—it should take more than 1 hour for water level to get to TAF
	4:15	37:28	Water level judged to have reached TAF		0			Japanese Government Report; and TEPCO Operators Report	This table entry disagrees with text, but timing is more correct
	5:00	38:13	Measurements	7.48	-2000		0.36	INPO 11-005	
	5:10	38:23	RCIC start was attempted and failed. TEPCO notification NEPA Article 15 (loss of reactor cooling function).					Japanese Government Report	
	5:15	38:28	Plant manager ordered completion of vent lineup					TEPCO Operators Report	Vent will not open until rupture disk pressure of 0.55 MPa is reached
	6:00	39:13	RPV water level		-3500			Japanese Government Report	
	7:39	40:52	PCV spray begun					Japanese Government Report	
	7:45	40:58	Measurements	7.31	-3000		0.46?	Japanese Government Report	Containment pressure is low for 40 hours of isolation. Maybe containment leakage is occurring.
	8:35	41:48	PCV MO valve was opened 15% per procedure					TEPCO Operators Report	
	8:41	41:54	Second AO valve set to open for wetwell venting					Japanese Government Report	Need to wait for rupture disk to break
	8:56, and again at 14:23 on 3/13 and at 4:24, 5:37, 8:00, and 9:34 on 3/14	42:09	Article 15 : radiation levels at the site boundary exceed limits					TEPCO Operators Report	Times reported by NISA Release #81 are a little different
	9:08	42:21	Operation to manually open SRV attempted. Some time after this SRV opened and closed due to problems with air supply and solenoid valves.					Japanese Government Report; and TEPCO Operators Report	Rapid depressurization. It took some time to start this, as no battery power existed and batteries were taken from cars.
	~9:20	~42:33	Decreasing trend of PCV pressure observed				0.54?	Japanese Government Report	TEPCO Operators Report says 0.637 MPa at 9:10 went to 0.540 MPa at 9:24. Rupture disk must have opened.
	9:25	42:38	Injection of borated water into RPV via fire extinguishing line					Japanese Government Report	Pressure must be <1 MPa
	9:36	42:49	Drop of DW pressure was confirmed					TEPCO Operators Report	
	11:17	44:30	Vent line AO valve found closed (loss of tank air pressure). From this point on, difficult to keep AO valve open due to problems with air supply and solenoid valve.					Japanese Government Report	
	12:20	45:33	Injection of freshwater terminated					TEPCO Operators Report	

Date	Time	Δ Time from Begin	Item	RPV Pressure, MPa	RPV Level Above TAF, mm	SP Temperature ºC	Containment Pressure, MPa	Source	Comment
	12:30	45:43	Operation to open AO valve on the pressure chamber side					Japanese Government Report	
	13:00	46:13	Measurements	0.29	-2000			INPO 11-005	
	13:12	46:25	Freshwater injection to RPV switched to seawater					Japanese Government Report	
	22:15	55:28	Diesel-driven fire pump stopped (before it ran out of fuel)					Japanese Government Report	
3/14	1:10	58:23	Seawater injection suspended as supply of seawater was running low		-2250			Japanese Government Report; and INPO 11-005 (for level)	
	3:20	60:33	Seawater injection resumed via fire truck					Japanese Government Report	
	4:30	61:43	Measurements		-3700			INPO 11-005	Core completely uncovered
			Measurement by CAMS, 140 Sv/hour. Core damage probability estimated at 30%.					Japanese Government Report	
	5:20	62:33	AO valve set to open for venting					Japanese Government Report	
	6:10	63:23	DW pressure 480 kPa				0.48	Japanese Government Report	
	9:05	66:18	DW pressure 490 kPa				0.49	Japanese Government Report	
	10:53	68:06	Measurements				0.52	INPO 11-005	
	11:01	68:14	An explosion[3] that appeared to be hydrogen occurred in upper part of RB (white smoke rose). Water injection stopped due to damage.					TEPCO Operators Report	
	11:25	68:38	Reactor pressure, DW pressure, SC pressure, level measurements	0.185	-1800		0.38	Japanese Government Report	
	16:30	73:43	Injection of seawater restarted					TEPCO Operators Report	
3/15	7:00, and again at 8:36, 16:22, and 23:20 on 3/15	88:13	Article 15 : radiation levels at the site boundary exceed limits					TEPCO Operators Report	Times reported by NISA Release #81 are a little different
	16:00	97:13	AO valve on the SC side found closed					Japanese Government Report	
	16:05	97:18	AO valve on the SC opened					Japanese Government Report	
3/16	1:55	107:08	AO valve on the SC opened					Japanese Government Report	
	~8:30	~113:43	A great deal of white smoke was emitted					Japanese Government Report	

[3] As used in this timeline, the term “explosion” could mean either a “deflagration” or a “detonation.” Which of these rapid hydrogen combustion events actually took place is still under study.