

**From:** [Barrett, Scott FLNR:EX](#)  
**To:** [Russell, Veronica A ENV:EX](#)  
**Cc:** [Berardinucci, Julia F FLNR:EX](#)  
**Subject:** FW: Operational Non-Compliance at IPPs Presentation\_Menezes 2012\_Final v Jn 29, Menezes 2012 Operational Non-compliance Report (Final) v Jn 29  
**Date:** Thursday, December 13, 2012 10:16:06 AM  
**Attachments:** [Operational Non-Compliance at IPPs Presentation\\_Menezes 2012\\_Final v Jn 29.pptx](#)  
[Menezes 2012 Operational Non-compliance Report \(Final\) v Jn 29.doc](#)

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Sincerely,  
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-----Original Message-----

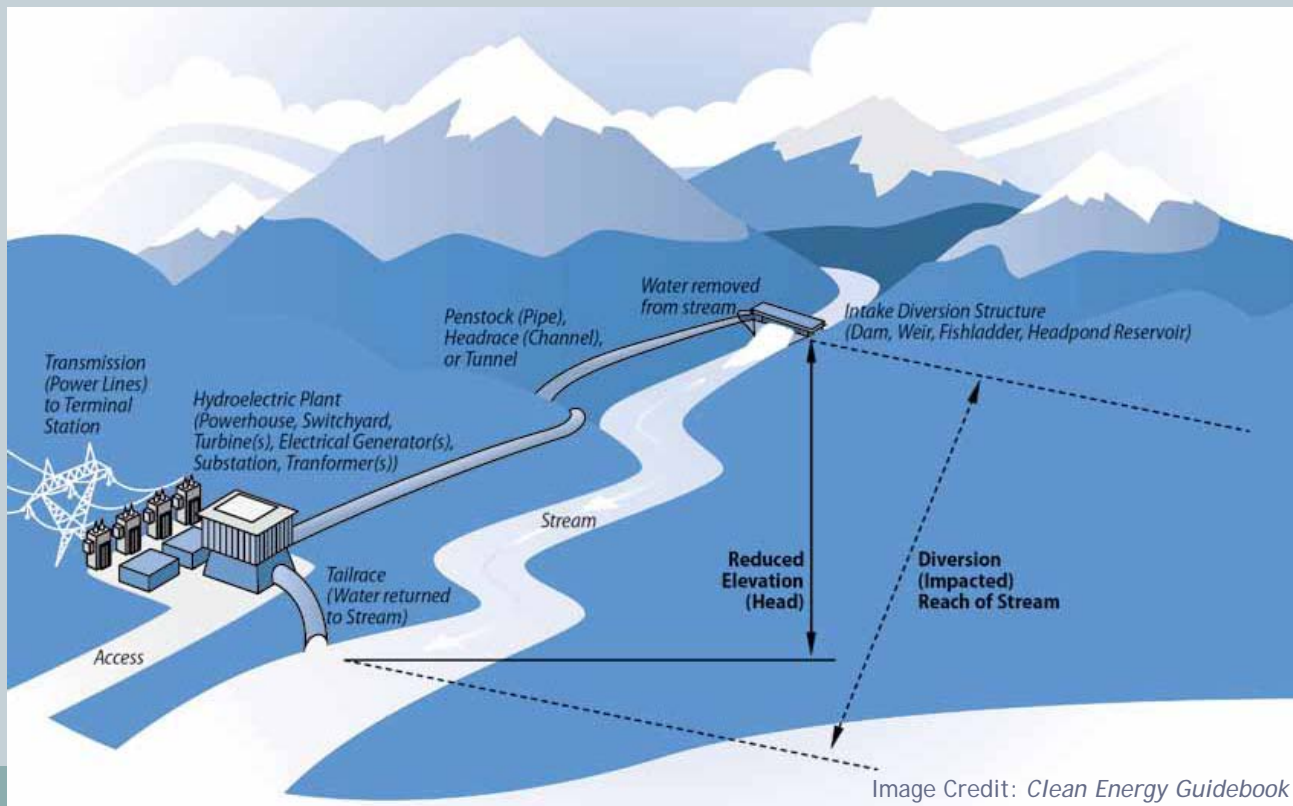
**From:** Berardinucci, Julia F FLNR:EX  
**Sent:** Friday, June 29, 2012 10:55 AM  
**To:** MacKnight, Heather FLNR:EX  
**Cc:** Malt, Joshua FLNR:EX; Barrett, Scott FLNR:EX; Robbins, Kristina FLNR:EX; Menezes, Charlene FLNR:EX; Babakaiff, Scott C FLNR:EX  
**Subject:** Operational Non-Compliance at IPPs Presentation\_Menezes 2012\_Final v Jn 29, Menezes 2012 Operational Non-compliance Report (Final) v Jn 29

Heather

As requested - final versions for forwarding as requested for the C&E July 7th workshop. Staff worked well together on polishing the wording. I have read and approve.

Julia

# Operational Non-Compliance of CEPs in the South Coast Region



Charlene Menezes  
M. Eng., P. Geo.

April 4, 2012

\* Associated Report: *Menezes 2012  
Operational Non-Compliance Report*

Image Credit: *Clean Energy Guidebook*

# Context

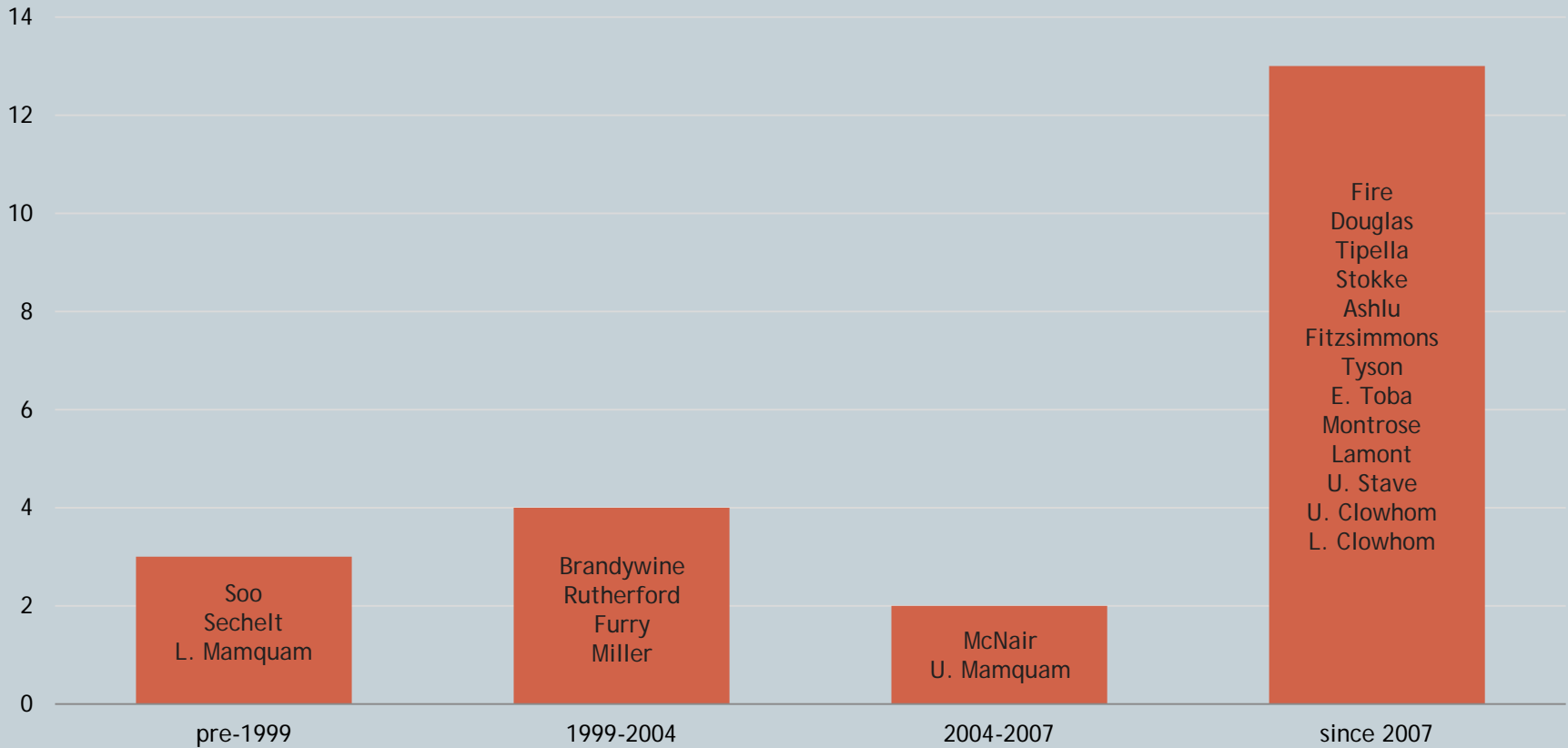


- 22 operational CEPs on South Coast, 3 imminent
- Mounting pressures and concerns about the potential extent of non-compliance
- Limited ability to respond to non-compliances
- Led to review of operational commitments & compliance assessment
- Objectives of this review:
  - Address potential environmental impacts
  - Improve overall management of CEP industry

# History of CEPs



Number of Facilities on the South Coast  
by Power Initiation Period



# OPPRs: A Primer



- Operating Parameters and Procedures Report
  - submission is a condition of the water license
- Describes what?
  - key operating parameters/requirements
  - procedures for how facility will be monitored
  - requirement to undertake mitigative actions
  - reporting commitments
- Importance
  - enshrines commitments related to water use
  - applies over lifespan of facility

# Regulatory Setting



## Proportion of Facilities on the South Coast with Commitments at time of Licensing



Note: Within OPPR, facilities may selectively commit to monitoring, mitigating, and reporting.

# Water Use Monitoring

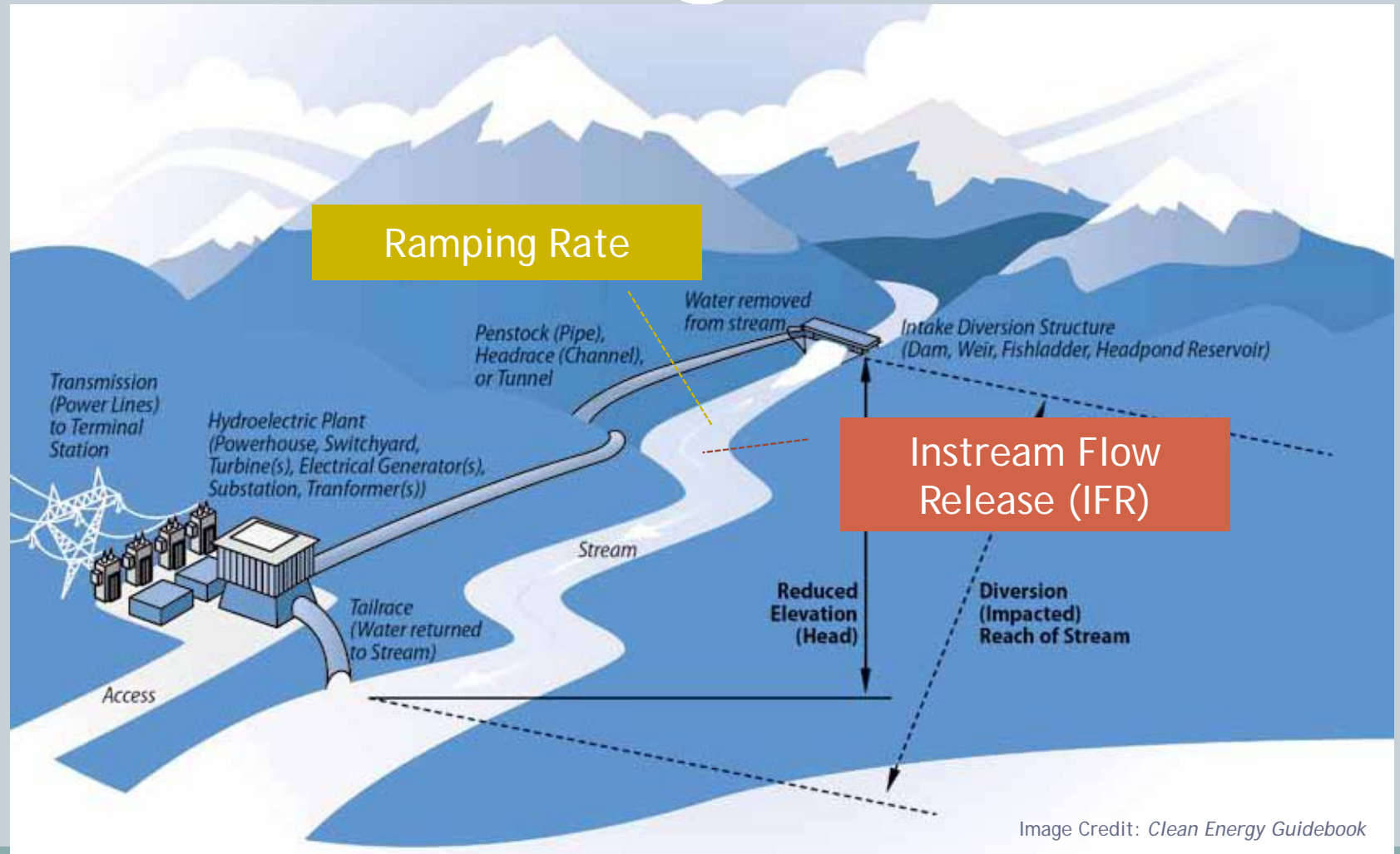
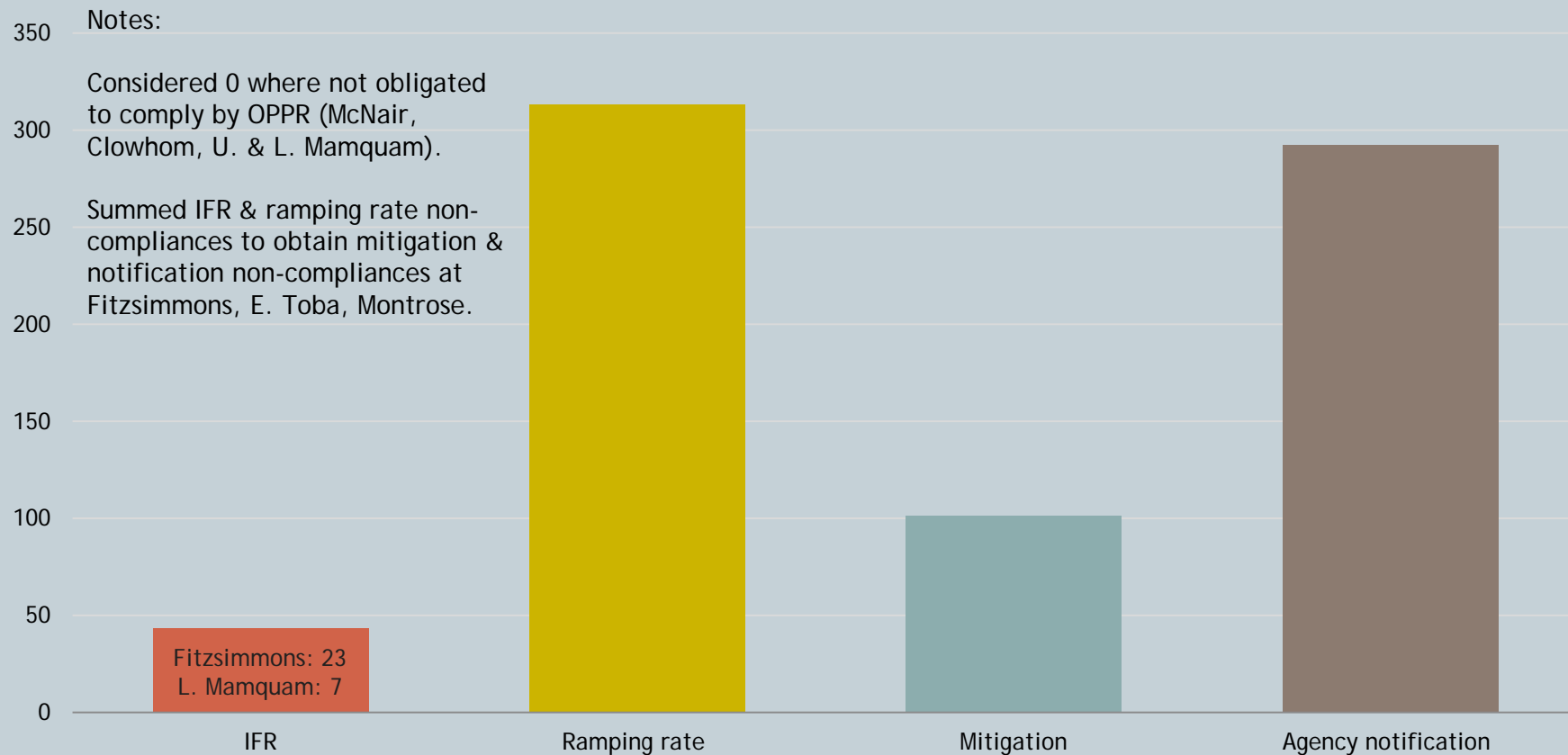


Image Credit: *Clean Energy Guidebook*

# 2010 Compliance Assessment\*



Number of non-compliances at 16 facilities on the South Coast in 2010

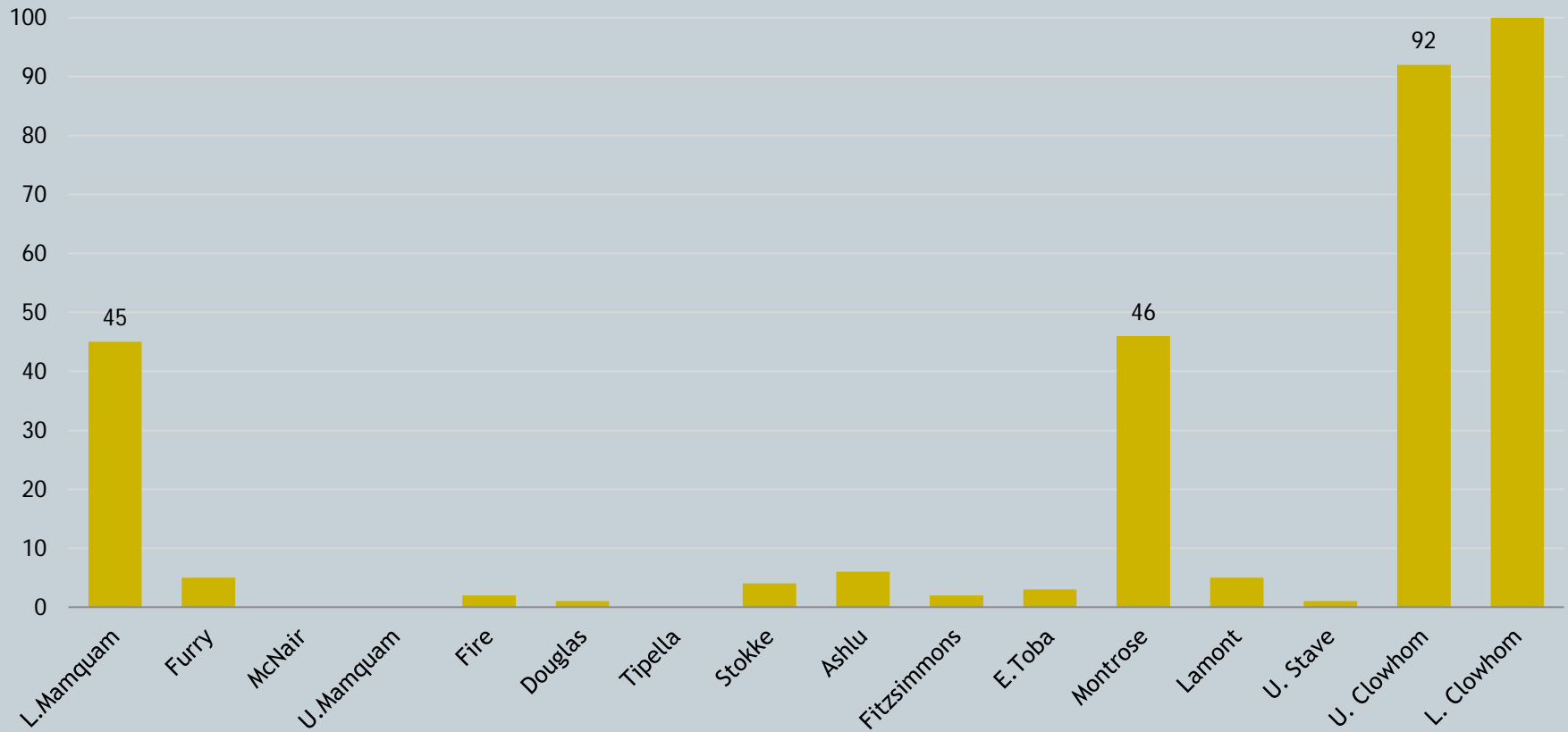




# 2010 Compliance Assessment



Number of ramping non-compliances  
on the South Coast in 2010

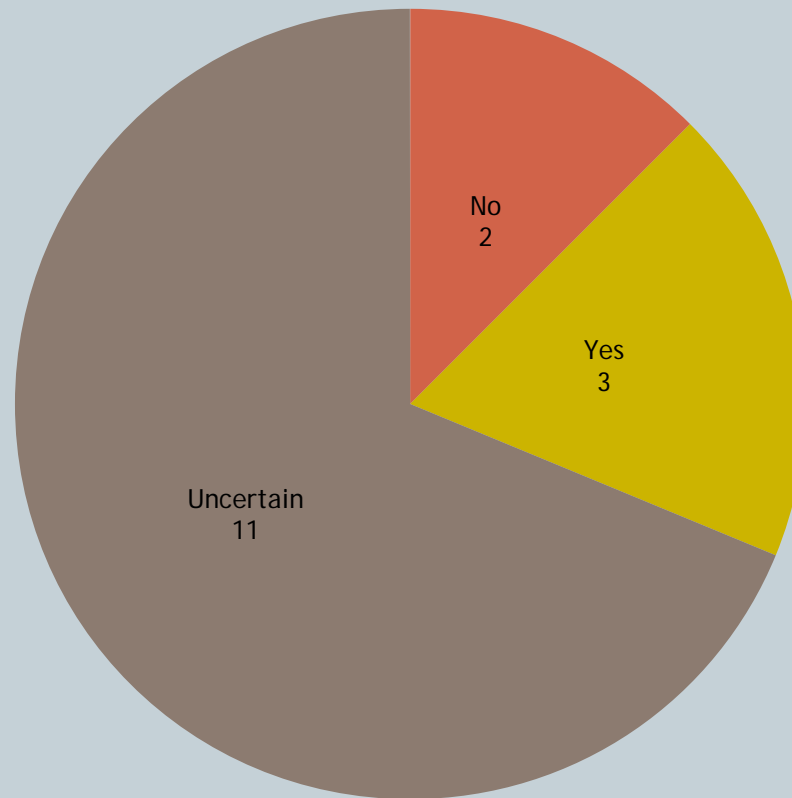


Note: U. Mamquam shown as 0 because not obligated by OPFR to monitor ramping rate.

# 2010 Compliance Assessment



Number of facilities on the South Coast in 2010  
where fish were stranded or killed



# 2010 Compliance Assessment



## Incidents on the South Coast in 2010 where fish were stranded or killed\*

Facility	Period of monitoring	# of non-compliance incidents	# of incidents impacting fish	# of fish stranded	# of fish killed
L. Mamquam	Sep - Dec	13	3	1	1
Ashlu	Jan - Dec	4	3	166	87
U. Stave	Jan - Dec	2	1	52	6

Notes:

- Lower Mamquam had number of stranding incidents; not known how many fish were impacted.
- Ashlu was in commissioning in 2010, so not obligated to report incidents.

# General Issues



- **Operational obligations**
  - LCO granted before OPPR finalized
  - OPPR revision tracking
  - Consistency among operating documents
- **Compliance reports**
  - Missing stream gauge data
  - Unreported incidents
  - Standardization of ramping assessments
  - Non-fulfillment of mitigation requirements
  - Unapproved protocol implementation
- **Incident follow-up**
  - Limited tracking ability
  - Lack of agency response

# Regulatory Setting Update



Proportion of Facilities on the South Coast with Commitments  
as of March 2012



Note: Within OPPR, facilities may selectively commit to monitoring, mitigating, and reporting.

# Status of OPPRs



## Current status of OPPRs at 22 CEP facilities on the South Coast

Satisfied	Agency review provided & no proponent response	Agency review and Order required	Absent
Ashlu	Fire	L. Mamquam	Soo
Fitzsimmons	Stokke	Rutherford	Sechelt
Furry	Tipella	Tyson	Brandywine
U. Mamquam	Douglas	Miller	
	U. Stave	McNair	
	Lamont		
	E. Toba		
	Montrose		
	U. Clowhom		
	L. Clowhom		

# Recommendations



- Compel owners to update OPPRs
- Clarify agency expectations with OPPR template
- Release flow ramping guidelines
- Improve coordination with Water Allocation
- Underscore commissioning phase expectations
- Finalize CEP database for incident tracking
- Establish OPP compliance monitoring program

# Thank you



## Acknowledgements

Ecosystems Section (S. Babakaiff, E. Stoddard)

Water Allocation Section (K. Johnson, A. Ullah, J. Davies)

Administrative Support Services (J. Becker, D. Ha)

## Questions? Comments?



## **Operational Non-Compliance of Clean Energy hydro-power facilities in the South Coast Region**

**Date:** March 29, 2012

**Author:** Charlene Menezes,  
M.Eng., P.Geo.

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### **Introduction**

Recently, there has been an increased level of awareness and concern regarding the potential extent of non-compliance with water license conditions at many of the approximately two-dozen small hydropower facilities (a.k.a. Clean Energy Projects, or CEPs) presently operating in the South Coast region. To date, the Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) has had limited capacity to respond to these non-compliance incidents.

The purpose of this report is to document the scope and causes of non-compliance at these facilities (via a summary of each operational facility's monitoring obligations and associated compliance), and to develop recommendations for addressing the issue. As such, this report will help to address potential environmental impacts associated with these incidents, and improve the overall ability of the provincial government to effectively manage this industry.

### **Methods**

The Operating Parameters and Procedures Report (OPPR) is a document that describes:

- key operating parameters/requirements, some of which are identified in appropriate permits and licenses;
- procedures for how the project will be monitored (to verify compliance with water license conditions & commitments); and
- reporting commitments.

In particular, the proponent commits to monitoring licensed water use (ie. maximum flow diversion) and restrictions intended to mitigate environmental impacts of water use (e.g. instream flow requirements (IFR) and flow ramping), and identifies actions to be taken following any associated non-compliance. The OPPR commits the proponent to submitting an annual OPP compliance report that summarizes such incidents in the previous year. Ultimately, the OPPR enshrines the proponent's operational obligations at the facility and is intended to apply over the complete lifespan of the facility but may undergo revisions at the discretion of the Statutory Decision Maker (SDM) for water licensing.

The CEP compliance assessment project involved two general phases: review of each facility's OPPR, and a comparison of their 2010 OPP compliance report with the monitoring and reporting commitments made in the OPPR with respect to water use. This report does not consider compliance with other water license obligations such as the biological monitoring specified in the 'long-term environmental monitoring program'. An Excel spreadsheet entitled "CEP summary table updated March 2012" was created to include information compiled during both

parts of the project. It consists of a summary tab of key findings from all facilities. Each facility also has its own tab which contains specific details on its non-compliances. If a facility was not operational in 2010 (i.e. Upper & Lower Bear, NW Stave), does not have an OPPR (i.e. Soo, Sechelt, Brandywine), or did not submit a compliance report (i.e. Rutherford, Miller, Tyson), compliance data are not included in the Results Section below. Additional notes on the interpretation of OPPR commitments and data presented in the respective 2010 OPP compliance reports are provided in Appendix 1.

## Results

Monitoring obligations described in the OPPR for facilities in the South Coast region are not consistent, particularly for facilities where ‘leave to commence operations’ (i.e. LCO) was granted prior to 2005 (Table 1). Non-compliances in IFR (or documented fish stranding) at several facilities have resulted in updated, more restrictive obligations (i.e. L. Mamquam, Furry, N. & S. Miller, U. Mamquam), but other pre-2005 facilities remain in operation without an OPPR (i.e. Soo, Sechelt, Brandywine). McNair, for instance, is scheduled to submit an updated OPPR at the end of March 2012.

Table 1. Compliance obligations for 25 facilities on the South Coast in 2010.

Facility	Year power generation initiated	Annual report submission	Monitoring			Headpond stage fluctuation	Agency notification	Mitigation efforts
			IFR	Maximum diversion	Ramping			
Soo	1994							
Sechelt	1997							
L.Mamquam	1996		■		■			
Brandywine	2003							
Rutherford	2004	■	■		●			
Furry	2004	●	●		●		●	●
N. Miller	2003	■	■		■			
S. Miller	2003	■	■		■			
McNair	2005		●		●			
U.Mamquam	2005	●	●		●		●	●
Fire	2009	●		●				
Douglas	2009	●	●	●			●	
Tipella	2009	●	●	●			●	
Stokke	2009	●	●	●			●	
Ashlu	2009	●	●	●			●	●
Fitzsimmons	2009	●	●	●			●	●
Tyson	2009	●	●	●		●	●	
E.Toba	2010	●	●	●			●	●
Montrose	2010	●	●	●			●	●
Lamont	2010	●	●	●			●	●
U. Stave	2010	●	●	●			●	●
U. Clowhom	2011	●	●	●			●	●
L. Clowhom	2011	●	●	●			●	●
U. Bear	2012 (summer)							
L. Bear	2012 (summer)							
NW Stave	construction							

Note: Shaded circle indicates recently updated obligations as per OPPR; shaded square indicates recently updated obligations as per OEMP.

Table 2 provides a summary of various types of non-compliance for the 16 South Coast region facilities required to submit monitoring data in 2010. It is observed that the five facilities with the greatest number of non-compliances in 2010 either obtained their LCO in 2010 (i.e. Montrose, U. & L. Clowhom, Fitzsimmons) or had operations changed (e.g. increased maximum diversion at Lower Mamquam).

Table 2. Summary of non-compliances of 16 facilities on the South Coast in 2010.

Facility	Total # of water use non-compliances	Period of monitoring (days)	Water use non-compliances per day	IFR	Ramping rate	Mitigation	Agency notification
L.Mamquam	52	273	0.19	7	45	2**	0*
Furry	7	365	0.02	2	5	7	7
McNair	0	59	0.00	0	0	0*	0*
U.Mamquam	0	365	0.00	0	0*	0	0
Fire	2	363	0.01	0	2	2**	2
Douglas	2	365	0.01	1	1	3**	3
Tipella	1	365	0.00	1	0	0	0
Stokke	6	365	0.02	2	4	2**	4
Ashlu	6	378	0.02	0	6	0	1
Fitzsimmons	25	268	0.09	23	2	25***	25***
E.Toba	6	132	0.05	3	3	6***	2
Montrose	49	153	0.32	3	46	49***	49***
Lamont	6	365	0.02	1	5	4	6
U. Stave	1	347	0.00	0	1	1	0
U. Clowhom	92	290	0.32	0	92	0*	92
L. Clowhom	101	290	0.35	0	101	0*	101
<b>Total</b>	<b>356</b>			<b>43</b>	<b>313</b>	<b>101</b>	<b>292</b>

\* indicates that value is shown as 0 only because facility was not obligated by OPRR to comply.

\*\* indicates that non-compliances were counted because they were reported to agencies, despite not being obligated by OPRR to comply.

\*\*\* indicates that value was obtained by summing # of IFR and # of ramping non-compliances. Worst case scenario.

Note 1: Total # of water use non-compliances excludes 2 non-compliances for maximum diversion exceedence (at Tipella and McNair facilities).

Note 2: No headpond stage exceedences found at Tyson facility.

Note 3: Period of monitoring at Ashlu includes data from 2011 (Jan - Apr).

As shown in Figure 1, the majority of non-compliances in 2010 were associated with ramping and the subsequent obligations to notify agencies and apply mitigative prescriptions (e.g. fish salvage).

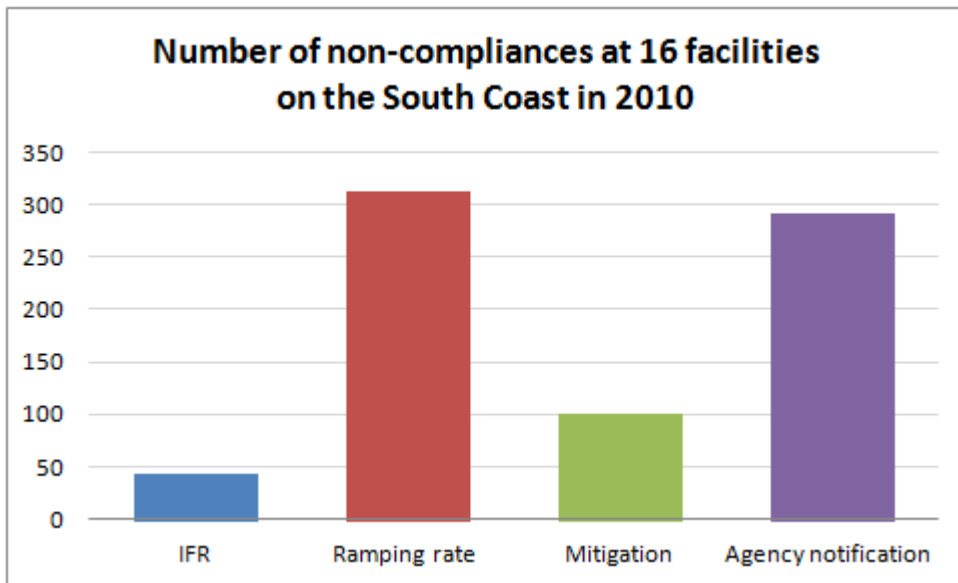


Figure 1. Number of non-compliances at 16 facilities on the South Coast in 2010.

Figure 2 summarizes the number of ramping non-compliances for each facility. The greatest number of non-compliances occurred at: Lower Mamquam (45) and Montrose (46), with the latter occurring over 2-3 months; and the Upper and Lower Clowhom facilities (92, 101), where ramping non-compliances occurred over a 10-month period.

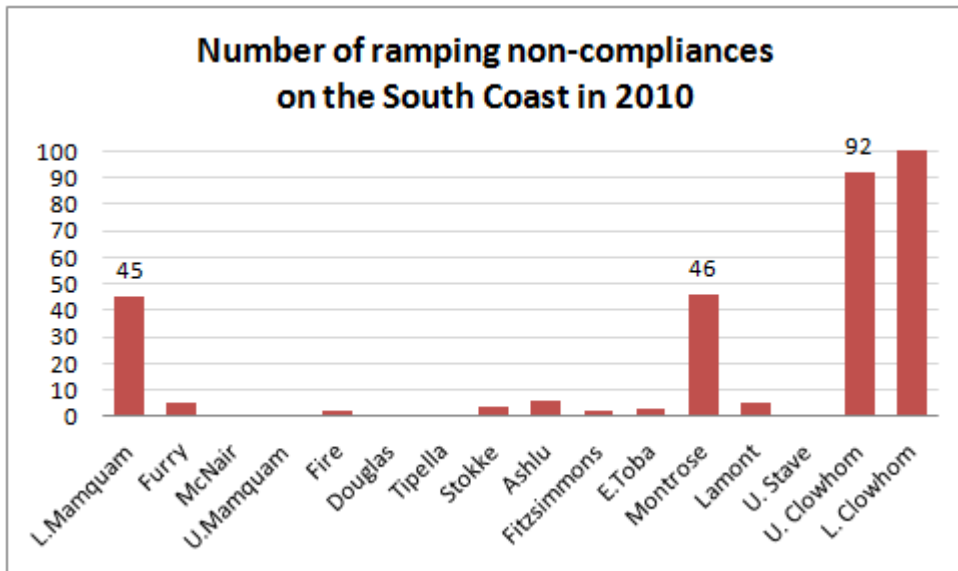


Figure 2. Number of ramping non-compliances on the South Coast in 2010.

The severity of ramping non-compliances cannot be reliably and consistently ascertained, as many facilities do not report duration and magnitude details within their compliance reports. Of those that do, average hourly rates for ramping non-compliances vary from 5 cm/h up to 25 cm/h. The duration of non-compliance events ranges from less than one hour up to eight hours (i.e. Ashlu).

With respect to non-compliance with IFR (Figure 3), Fitzsimmons had the greatest number (22). Although Furry technically reported one IFR incident, non-compliance events were ongoing for nearly two and a half months, and therefore, the ‘one incident’ warrants emphasis. When all non-compliances in IFR for all projects are considered, the average deficiency was relatively high (35% below IFR, ranging from 1% to 60%), with the duration of these IFR non-compliances ranging from a few hours to 10 days.

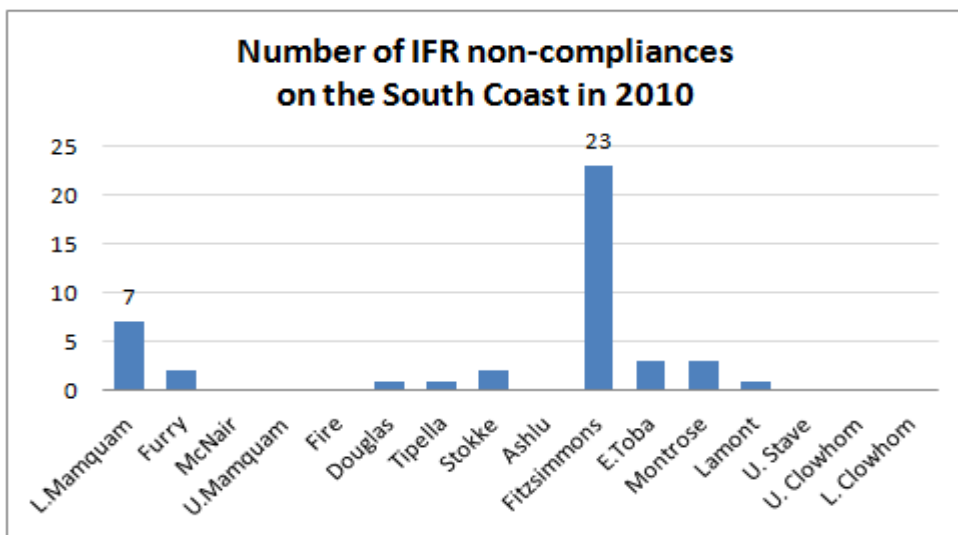


Figure 3. Number of IFR non-compliances on the South Coast in 2010.

As per Figure 4, fish strandings (and mortalities) occurred at three South Coast facilities in 2010 (Ashlu, L. Mamquam and U. Stave). Although non-compliance incidents which stranded or killed fish were reported, these numbers must be considered as the minimum as there is not a consistent level of monitoring, reporting and mitigation (search and salvage) in the OPP at all facilities. This results in many non-compliance events having an “uncertain” status with respect to fish stranding or killing. Where a non-compliance incident was categorized as “Yes”, there were a total of 7 incidents which resulted in 94 confirmed fish mortalities (Table 3).

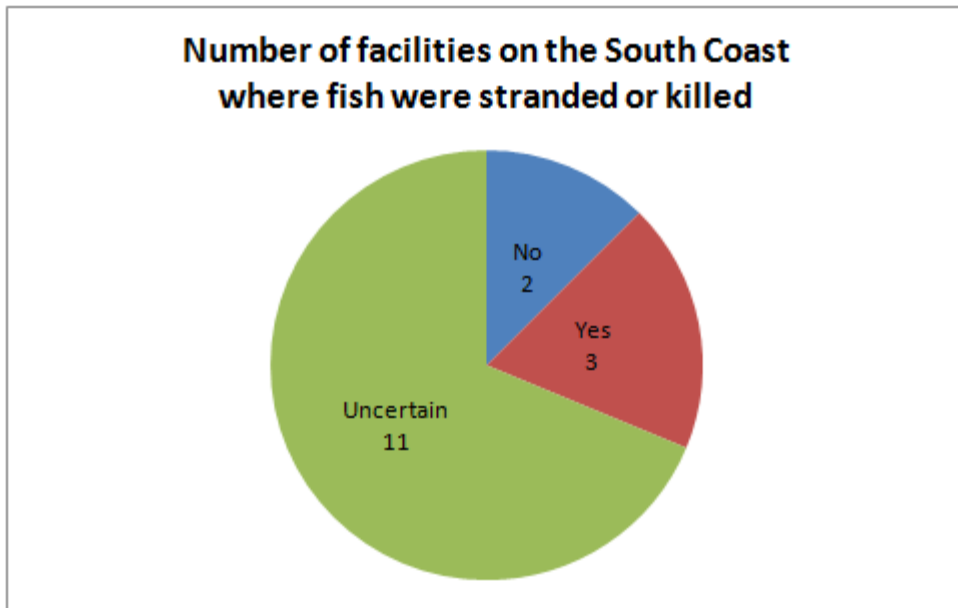


Figure 4. Number of facilities on the South Coast where fish were stranded or killed in 2010.

Table 3. Incidents on the South Coast in 2010 where fish were stranded or killed.

Facility	Period of monitoring	# of non-compliance incidents	# of incidents impacting fish	# of fish stranded	# of confirmed fish killed
L. Mamquam	Sep - Dec	13	3	1	1
Ashlu	Jan - Dec	4	3	166	87
U. Stave	Jan - Dec	2	1	52	6

Notes:

- Lower Mamquam had number of stranding incidents; not known how many fish were impacted.
- Ashlu was in commissioning in 2010, so not obligated to report incidents.

**Discussion**

- General issues:
  1. **Operations during commissioning phase.** The Ashlu facility had an unusually-long period of commissioning during which time it is understood that the proponent was able to generate and sell power but not be held to constraints within the OPPR since an OPPR had not yet been finalized and accepted. This ambiguity has meant that incidents which occur at facilities during the commissioning phase cannot be considered non-compliant despite causing potentially harmful ecological impacts.

2. ***OPPR completion and revisions.*** Facilities have been granted leave to commence operations (LCO) without having their OPP and reporting obligations finalized. This is particularly concerning given that in the first year of operation, non-compliances are generally observed to be higher than in subsequent periods. Inadequate or delayed compliance monitoring can result from a facility being allowed to commence operations before commitments (e.g. ramping rates) are studied and enshrined in the OPPR. Furthermore, if/when OPPRs are updated, there is uncertainty as to whether these drafts have been reviewed and accepted by Water Allocation staff and are consequently binding.
3. ***Consistency among various operating documents.*** The OPPR is the primary document that enshrines obligations during operation; however, there can be several other documents, such as the OEMP (or ‘Operations Plans’ in older facilities), which specify some of the same parameters and procedures. It is important to ensure consistency among these documents so that there is no uncertainty regarding how the facility is being operated and monitored.
4. ***Missing stream gauge data.*** Facilities have been observed to operate through periods where there is no data, usually as a result of poor maintenance of stream gauge functionality. Such periods of missing gauge data have been reported to span from hours to multiple months in extreme cases (i.e. L. Mamquam, E.Toba/Montrose). The total number of IFR and ramping non-compliances should be consequently considered a minimum value as compliance cannot be confirmed during these periods.
5. ***Unreported incidents.*** . Certain facilities have experienced a number of IFR and ramping non-compliances according to their annual reports. In some of these cases, no notification reports were submitted to the agencies following the incident. The lack of notification was explained in later annual reporting by deeming the effects as insignificant (e.g. Montrose). In cases where notification requirements exist, unreported incidents constitute non-compliance (unless they are permitted within their OPPR to define insignificance based on pre-defined criteria). In certain cases there may be justification for modifying non-compliance thresholds or required methods used to define these thresholds, such as when non-compliances are not attributable to project operations (i.e. avalanches). However, these modifications should be made through formal changes to the OPPR, not through justifications made within annual reporting.
6. ***Absence of flow ramping guidelines.*** At particular facilities (e.g. Harrison cluster, which includes Fire, Douglas, Tipella, Stokke, Upper Stave & Lamont), ramping has been assessed only during start-ups and shut-downs rather than over the full period of operations (i.e. during flow-following). Even at facilities where ramping events due to flow-following, minimum start-up flow, or minimum shut-down flow are singled out, the group of events themselves or their effects are dismissed as insignificant (e.g. E. Toba, Montrose). This issue is largely a result of the lack of consistently applied guidelines for ramping thresholds and related timing requirements, combined with attempts by some proponents and operators to apply non-standardized approaches. Joint industry-agency

flow ramping guidelines are currently under development, but have yet to be finalized or released to industry.

7. ***Follow-through in completion of mitigative actions in event of non-compliance.*** The absence of subsequent mitigative efforts such as the search of sensitive sites and fish salvage poses a high risk to fish and fish habitat values at facilities where there are known to be species of concern and limiting life stages. In some cases, a facility's OPPR does not commit to this undertaking because of the difficulty accessing the site in a timely manner (e.g. U. & L. Clowhom). In other instances, despite access issues, facilities do commit to mitigate in their OPPR, but then consistently breach this obligation and attribute it to the facility's isolation (e.g. Montrose).

Additionally, the quality of the search to determine fisheries impacts during non-compliance can be constrained by the number of sensitive sites that require assessment before the stage/flow returns to being in compliance.

8. ***Adopting protocol without*** agency approval. Examples of this issue include deviations from DFO default ramping rates, and criteria for excluding ramping events from classification as non-compliant (natural events, short-duration events minimally exceeding threshold). Also, with respect to the requirement to undertake mitigative actions, certain facilities have not adhered to this if the plant shut-down was followed by an "immediate restart", but no definition of this is provided. The use of flawed stage correlations between gauge sites and sensitive sections (e.g., U. & L. Clowhom) serves as another illustration of this point. Similar to point #5 above, these decisions have been made without the requisite changes to the proponents' OPPR. If changes to ramping thresholds or associated methodology are required, these should be done through formal modifications to the OPPR, as per approval by the SDM. Also, with respect to the requirement to undertake mitigating actions, certain facilities have not adhered to this if the plant shut-down was followed by an "immediate restart", but no definition of this is provided. The use of flawed stage correlations between gauge sites and sensitive sections (e.g., U. & L. Clowhom) serves as another illustration of this point.

9. ***Incident follow-up.*** There has been a lack of resources (staff, database tools) at MFLNRO to track/monitor compliance at various facilities. Ultimately, there is limited compliance and enforcement (C&E) of the water use obligations. Environmental Monitors (EMs) are required onsite to monitor compliance during construction, but there is limited agency oversight during the operational phase.

- Recommendations for OPPR template modifications:

1. ***Hydrometric monitoring procedures.*** There is a need to be more precise about hydrometric monitoring procedures in the template: real-time stream gauges, with high sampling frequency, linked to PLC with appropriate alarm levels, with frequent operator review of data, and maintenance of gauge and rating curve.

2. **Maximum allowable diversion.** Verification that a facility is not exceeding the maximum allowable diversion as per their water license is currently done through submission of water license returns detailing energy production. As an additional check, the proponents should be directed to commit to including plant flow data in their annual compliance report, which will also enable regulators to easily verify times when the plant is not operating.
3. **Ramping rate monitoring protocol.** A number of specifications on ramping rate monitoring protocol from the soon-to-be released Flow Ramping Guidelines need to be added to the OPPR template. They include details on: how ramping rate is calculated; how ramping effects are assessed at sensitive sites; over what period of operations ramping effects are to be assessed; criteria for excluding ramping events from classification as non-compliant (magnitude, duration of short-term exceedances); specific reporting of magnitude (expressed as all of maximum hourly, average hourly, and total stage change) and duration for each non-compliance event.

The template should specify that proponents include a 'ramping non-compliance action flowchart' in their OPPR that outlines who does what, and when, in the event of a possible non-compliance.

4. **Agency notification.** In the past, there have been inconsistencies in expectations regarding the timing of initial notification to MFLNRO by the proponent in the event of non-compliance (either 24 hours or 48 hours from event). The timing of this and follow-up reporting needs to be resolved in the template.
5. **Remote facilities.** Particular consideration needs to be given to how remote facilities are expected to reasonably notify and mitigate following a non-compliance incident as this issue is not addressed at present.
6. **Timing of maintenance operations.** The timing of maintenance operations, which include headpond sediment flushing, and clearing of IFR pipe/gate obstructions needs to be addressed with due consideration given to fish spawning, in addition to the timing of high flows.

## **Recommendations**

1. **Resolve commissioning phase ambiguities.** The uncertainty surrounding monitoring commitments during this phase relates to the need for OPPRs to be submitted earlier in the permitting process. It is recommended that acceptance of an OPPR as satisfactory be required by the Water SDM prior to initiation of wet commissioning. Furthermore, improved awareness and communication of monitoring and operational expectations during commissioning is required: agency staff needs to convey these expectations to their delegates (Independent Engineer, Independent Environmental Monitor) who in turn communicate them to the proponents of these facilities.



2. **Clarify agency expectations with OPPR template.** There is currently a wide range in the level of detail on monitoring and reporting offered by proponents in their OPPR, and consequently, monitoring and reporting commitments vary from facility to facility. To resolve this, it is recommended that an OPPR template be developed and approved for widespread reference.
3. **Obtain updated OPPRs from proponents.** Older facilities with out-of-date or no OPPRs should be required to submit updated documents once they have been advised of agency expectations. Specific actions include:
  - i. Obligate Soo, Sechelt and Brandywine facilities to develop and submit OPPR.
  - ii. Follow-up on McNair's OPPR, which is expected at the end of March 2012.
  - iii. Obligate Fire, Douglas, Tipella and Stokke facilities to update their OPPR to include commitments to mitigate.
  - iv. Obligate Clowhom facilities to update their OPPR to include commitment on mitigation, despite facility's isolation.
  - v. Obligate E. Toba and Montrose facilities to update their OPPRs to reflect their commitment to including plant flow data to monitor maximum diversion.
  - vi. Obligate Tyson, Miller and Rutherford facilities to reproduce obligations made in updated operating documents in revised OPPRs.
  - vii. Obligate L. Mamquam and Rutherford facilities to update their OPPRs to reflect the full suite of commitments (monitoring, mitigating and reporting).
4. **Wide release of approved flow ramping guidelines.** A draft version of these guidelines has been developed and submitted by the consultant in December 2011. Approval of the final document and its release to proponents and consultants needs to be expedited.
5. **Improve communication and coordination with the Water Allocation section.** Monitoring and reporting obligations during operation need to be finalized before the granting of Leave to Commence Operations (LCO). Action on this general recommendation requires the cooperation of Water Allocation staff that is responsible for issuing the LCO. A further recommendation, in light of continuous revisions to OPPRs, is that the OPPR status for each facility be clarified by Water staff to avoid future uncertainty. Specific actions include:
  - i. Resolve outstanding acceptance by Water Allocation of Feb 2011 Lower Mamquam OPPR (draft).
6. **Tracking of compliance issues through database tool.** Currently, MFLNRO's Water Allocation and Ecosystems staff are notified about non-compliance incidents by email; their ability to respond to these issues is limited by the sheer number of facilities and incidents and agency resources. To assist with this, a CEP database is presently under development; it will allow tracking of non-compliance incidents, including details on occurrence and incident deliverables. Specific actions include:
  - i. Obtain annual compliance reports for Miller, Tyson and McNair facilities.
7. **Re-establishing compliance monitoring program.** Such a program could be similar to monitoring in the mid-2000's (Ecosystems Section - Scott Babakaiff) which involved

measuring downstream discharge at facilities at different times of the year and comparing the measurements to IFR requirements stipulated in the water license. Formal inspections and audits are mechanisms that could be used to improve compliance.

## Appendix 1

### Notes on interpretation of compliance with OPP

1. Certain older facilities do not have OPPRs but have included some monitoring obligations in their Operational Environmental Monitoring Plan (OEMP) or Operations Plan. These facilities were identified under the heading “OPP Monitoring Obligations” in the summary tab, under a newly created line item “Obligations specified elsewhere? If yes, Date, Version, Document” (i.e. Rutherford, Miller, Tyson). All the available documents were used to compile obligations, and comments have been inserted to note which commitments originated from which document.
2. For facilities that did not have an OPPR current to 2010, compliance was assessed against conditions identified in the water license and/or long-term environmental monitoring program report (i.e. L. Mamquam, Furry, U. Mamquam and Fitzsimmons). Although these facilities did not have a valid OPPR at the time, the conditions pertaining to IFR and ramping rate identified in the aforementioned documents would have been the same as those in an OPPR, had it been submitted. These obligations were subsequently enshrined in an OPPR document (see table below).

<b>Facility</b>	<b>LTAM Report Submission Date</b>	<b>Period of Compliance Monitoring</b>	<b>OPPR Date</b>
L. Mamquam	21 Dec 2011	Sep 2010 - Aug 2011	Feb 2011 (not accepted)
Furry	7 Mar 2011	2010	20 Jan 2012
U. Mamquam	Jul 2011	2010	Dec 2011
Ashlu	29 Jun 2011	Apr 2010 - Apr 2011	26 Jul 2011
Fitzsimmons	31 Mar 2011	2010	31 May 2011

The Ashlu facility was generating and selling power through a long period of commissioning in 2010 but not held to submit and follow an OPPR during this time. Although incidents at the facility cannot strictly be considered non-compliant over this duration, those that were reported as such to the agencies were recorded as non-compliance incidents.

Facilities that have updated their OPPRs since 2010 have been distinguished within the heading “OPP Monitoring Obligations” in the summary tab of the spreadsheet, under a newly created line item “OPPR updated since 2010?”

3. Typically, monitoring for compliance spans the calendar year with report submission occurring in March of the following year. However, at certain facilities, monitoring programs straddle two calendar years because of a mid-year start to the monitoring program (e.g. Ashlu, L. Mamquam, and U. & L. Clowhom). These cases were documented under the heading “OPP Monitoring Results for 2010” in the summary tab, under a newly created line item “Monitoring Period (if beyond 2010)”.

This reviewer is aware that for certain cluster projects, or multiple projects with the same owner, the proponent has been known to request and obtain approval for staggered report submission; specific instances of this are unknown, but could be included in this row of the spreadsheet in the future.

4. The “Graphical Data” tab includes a “Summary Table of Number of Non-Compliances by Facility”. For facilities with compliance data, the period of monitoring in days was tabulated here. This value was calculated by subtracting the approximate number of days of missing gauge data from the number of days in the flow monitoring period (e.g. Apr to Dec 2010).
5. There are instances where a number of ramping events occurred at around the same time, are caused by the same mechanism, and/or comprised a ramp-up and ramp-down. For ease of event interpretation, where possible, non-compliance events were grouped into incidents. These incidents can be identified on project-specific tabs by coloured highlighting (e.g. E. Toba).
6. Within certain compliance reports (e.g. Harrison cluster), the time series of hourly stage change was presented in graphical form, but specific details about the ramping non-compliance events were not provided. In these cases, the magnitude and duration of the non-compliances were interpreted from the plots by this reviewer; such values should be considered approximate and have been distinguished by a preceding tilde symbol (~) in the spreadsheet.
7. In their OPPRs, certain facilities did not commit to notifying agencies or undertaking mitigative steps in the event of a non-compliance and, as a result, they are not obligated to do so. The “Total # of non-compliances in mitigation after non-compliance” and “Total # of non-compliances in Agency notification after non-compliance” have been represented as “0\*” in the summary spreadsheet (i.e. McNair, U. & L. Mamquam, U. & L. Clowhom) with explanatory notes at the bottom of the table.

Some proponents have consistently mitigated despite not committing to this in their OPPRs (i.e. Fire, Douglas, Stokke). The few instances where they have subsequently failed to comply were recorded in the spreadsheet with a non-zero number “XX\*\*” and explanatory notes at the bottom of the table.

Two facilities reported non-compliance in maximum diversion (i.e. Tipella, McNair). McNair was not obligated to do so as per its OPR.

8. With respect to fish impacts, in some cases, searches were delayed and are therefore likely to be ineffective. The date of the search was noted (where known) under “Mitigative Efforts Undertaken” in the project-specific tabs.
9. Practical responses to the question “Fish stranded or killed as result of non-compliances?” were considered to be “Yes (quantify)”, “No” and “Uncertain”. Where numbers of fish stranded or killed were included in the summary tab, it must be

emphasized that this is a minimum value; often, there were other incidents where no search and salvage took place, and so additional fish impacts were not known.

10. At some facilities, there were too many supplemental non-compliances (duty to mitigate and notify) to be accurately quantified. These were reported in the summary tab to have “multiple dates” of supplemental non-compliances; but, for graphical purposes, in the “Summary Table of Number of Non-Compliances by Facility”, they have been enumerated by summing the number of IFR and ramping non-compliances and assuming a worst-case scenario (e.g. E. Toba, Montrose).