



## Hurricane Gustav, Landfall, Energy Infrastructure and Updated Damage Models -- Thread #5 (Updated 9/1 21:00 EDT)

Posted by [Prof. Goose](#) on September 1, 2008 - 4:00pm

Topic: [Supply/Production](#)

Tags: [chuck watson](#), [henry hub](#), [hurricane gustav](#), [loop](#), [louisiana offshore oil port](#), [methaz](#), [oil](#), [oil infrastructure](#), [original](#), [peak oil](#), [shut-in production](#) [[list all tags](#)]

Hurricane Gustav made landfall in LA just south and east of NOLA as a Category 2 hurricane.

Models done after landfall and their damage forecasts are included below.

The [Louisiana Offshore Oil Port](#), or LOOP (see *JoulesBurn's story on the LOOP here*), and [Port Fourchon](#), which has historically been a land base for offshore oil support services in the Gulf, was in the path of Gustav and is expected to be damaged. As you will see below, a good bit of oil and natural gas is also expected to be taken offline: some for weeks, some for much longer, according to Methaz' models.

Matthew Simmons, of Simmons International says this about the importance of the [LOOP](#):

LOOP is the only facility in the Gulf to unload VLCC tankers which carry over 2 million barrels of crude. They can in theory be "literated" by unloading onto smaller tankers that can make it into the Gulf Coast ports but this is very lengthy timewise and the spare capacity of these smaller tankers is slim. We get about 1.2 million b/d of crude imports through Loop. (+/- 10%)

**Our next update will likely be in the morning.** Keep scrolling, there's a LOT of maps, data, and information in these posts. *We appreciate your help accumulating resources, stories, and newstips in the comment thread below!*

Updates today from [Chuck Watson at KAC/UCF](#):

Here's the 9/1 update:

Well, I think someone (who out of modesty shall remain nameless) forecast several days ago, Gustav would hit unfavorable conditions in the northern Gulf and never make it back to mega-storm strength. That seems to be the case. Center landfall with peak winds of 100kts or maybe slightly less looks to be at Grand Isle, at 8am ET - as of 730et the "eyewall" appears to be touching land.

I'm mostly sticking with the synthesis from last night (based on multiple models) as to impacts, and we're now in a "wait and see what the inspections bring" mode. The big question is what if any major damage the LOOP suffered and (perhaps more vulnerable than the LOOP itself) the connection pipelines to shore. Baseline estimate is 10-14 days

for the port itself. Radar shot (7:30am ET) with tracks and LOOP labeled attached.

Production: Unless something broke that shouldn't have, we expect production to be back up to 60-70% within 30 days, and back to 95% by the end of the year. We expect a long-term hit of 3% or so since this swath went through some areas that Ivan, Katrina, and Rita missed and some older, less productive wells will not be restored.

Refineries and distribution: Mainly short term disruption due to precautionary shutdowns, no long term unless we get unlucky with pipelines.

All in all, my thinking is that this could have been a lot worse. Storm was disorganized crossing the OCS, so waves and storm surge will be lower than they should be for a storm of this size and intensity.

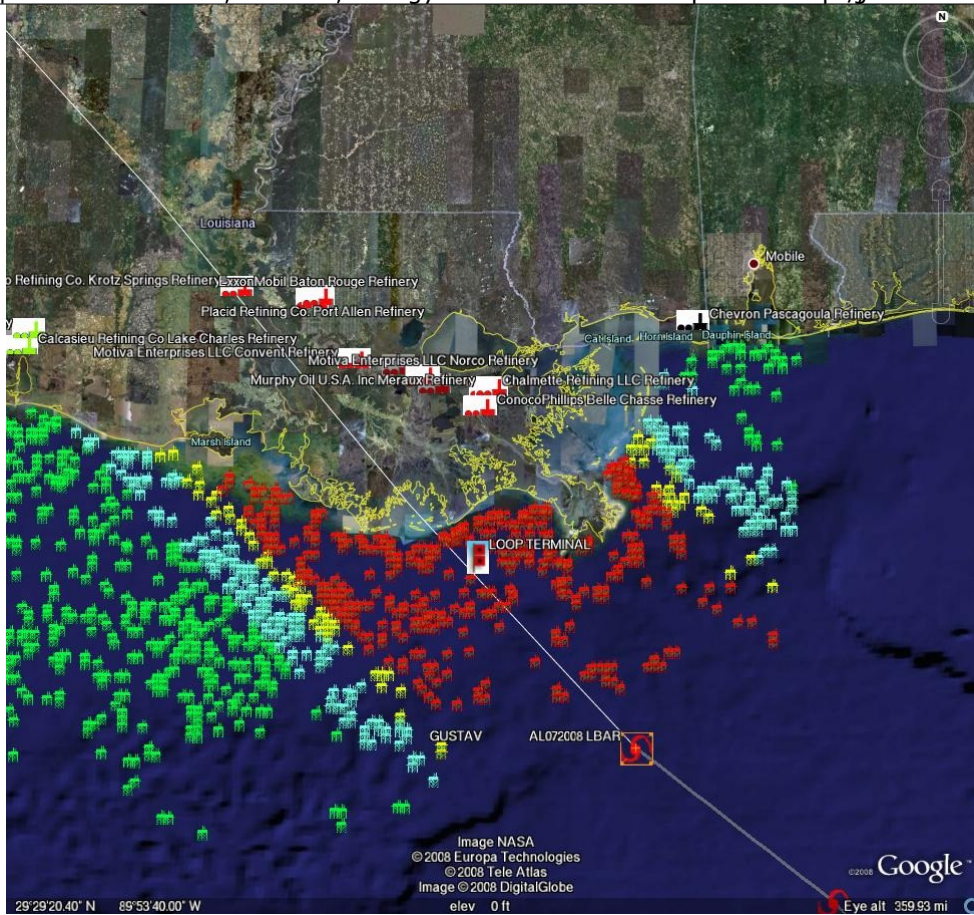
Here is Chuck's landfall composite for Gulf (GOM) oil and NG production, which covers the GoM loss for the month of September in to the context of overall oil production, imports, and refining. Note for those crunching the numbers that since GoM is about 25% of US production, 40% of the GOM's contribution of 25% is 10% of the total US production.

COMP ATCF Forecast Time: 2008090112

14 day:	8.21 MMBBL ( 52.36% normal),	gas	63.50 BCF ( 65.91% normal)
30 day:	19.98 MMBBL ( 59.46% normal),	gas	145.98 BCF ( 70.70% normal)
60 day:	43.01 MMBBL ( 64.00% normal),	gas	304.43 BCF ( 73.73% normal)
90 day:	95.23 MMBBL ( 94.47% normal),	gas	586.06 BCF ( 94.62% normal)
6 mon :	195.13 MMBBL ( 96.79% normal),	gas	1205.43 BCF ( 97.31% normal)
1 year:	400.48 MMBBL ( 97.96% normal),	gas	2478.60 BCF ( 98.67% normal)

Interpretation: the models say that **40% of GOM oil will be offline for 30 days and ~30% of GOM NG for will be offline for 30 days**--followed by marginal increases in GOM supply (both imports and production) through the next months. (E.g., the 60 day number for oil is 36% shut-in, but between 60-90 days, the number goes down to 5% of GOM oil shut-in.)

**UPDATE: 10:00 EDT 9/1** - Graphic below is damage models based on LBAR hurricane forecast track, key is below. Numerical damage estimates are below the fold for oil and natural gas shut-in and damage.



*Path/damage estimates using LBAR 10:00 EDT forecast-click twice to enlarge*

For all graphics: Rigs/Platforms: Blue: evacuated only; Yellow will require inspection before restart; Red: damage requiring repair; Refineries: Black: operational impact (partial shutdown) Green: Operational impact (full shutdown) Red: Damage likely; Ports: standard hurricane flags for wind

We are not hurricane experts at theoil drum.com. Neither are we experts on damage forecasts to oil and gas infrastructure from weather events (though thankfully we do have an [expert](#) that helps us). What we try to do, and have been doing for over 3 years, is articulate the fragility and urgency of our nation's, and our world's, energy situation. As Hurricane Gustav moves nearer, and professional meteorologists and energy analysts gauge the impact it may have on our energy infrastructure, feel free to browse our archives of hundreds of empirically based analyses and perspectives on the myriad energy issues that form the backdrop not only for this hurricane, but for any exogenous event that disrupts the increasingly uneasy balance between energy supply and demand in our modern interconnected world.

There are many resources under the fold (by clicking "there's more" in this post), including details of the latest oil/infra damage estimates from [Chuck Watson at KAC/UCF](#) as well as lot of other resources including rig maps, models, google earth maps, and a lot more in the comments.

[Click map to go to WUnderground](#)

**LAST 24 HR FORECASTS FROM CHUCK WATSON**

Here's Chuck's 23:00 EDT 8/31 update:

Synthesis of data available at this time: The Loop looks to take a direct hit. Estimating minimum 14 days down time assuming it holds up to specs. Peak waves probably in the 40-45 ft range offshore, so any remaining older stuff built to the older air gaps are probably toast; the newer stuff (55ft gaps) should be OK, but will take a few wave hits. Some potential for undersea slumping and scour - bet we loose some pipelines. GOM overall production will probably take at least a 3-5% permanent hit; pending new wells. Bunch of minor damage to "refinery row" (in along the river); most should be back up in a week or so, if product is available. Humanitarian note: this isn't a great track for NOLA, but the weakness we're seeing on the normally stronger side of the storm may save it from worse damage.

Based on the 18Z (2pmEDT) update: While not wonderful, the forecasts for GOM infrastructure continue to improve. While the NHC forecast remains pessimistic, and Gustav shows some signs of trying to regain its strength, it is not having a lot of success. For wave and surge generation, organization is key - even if the spot winds pick up, unless the wind field is organized well overall surges and waves will not be as high as the raw wind speed might indicate. Our surge models are dropping water levels significantly (still, 18 ft will ruin your day). Surge model run is attached - much less dramatic than the Cat 4 maps floating around. Damage trends for other models are improving as well. This is looking less and less bad for the GoM Oil/Gas production, IF the post-Katrina improvements hold. The disorganization and track shifts have reduced the threat to the LOOP - makes me happier. I'm really thinking that by tomorrow evening we will be talking about "dodging a bullet". Final word: DON'T NOT EVACUATE JUST BECAUSE THINGS LOOK BETTER! These are just models. Don't bet your life on it.

**Production/Damage Estimates**

(UPDATED 10:00 EDT 9/1)

Here are production estimates from Chuck Watson:

Here's our final pre-landfall composite: COMP ATCF Forecast Time: 2008090112  
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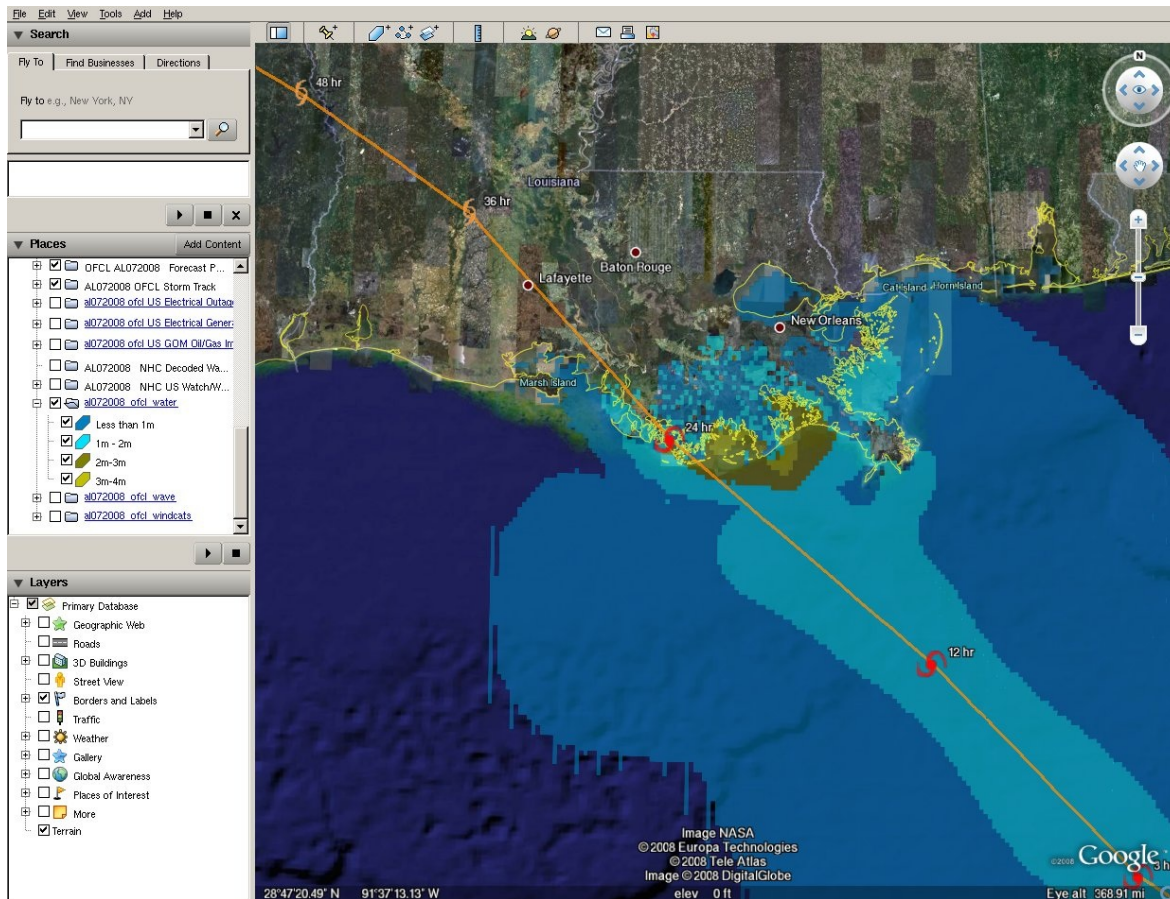
Early on 8/31, when models were improving, Chuck said:

This is looking less and less bad for the GoM Oil/Gas production, IF the post-Katrina

improvements hold. The disorganization and track shifts have reduced the threat to the LOOP - makes me happier. I'm really thinking that by tomorrow evening we will be talking about "dodging a bullet".

Final word: DON'T NOT EVACUATE JUST BECAUSE THINGS LOOK BETTER! These are just models. Don't bet your life on it.

Here's a new graphic for the forecasted surge from Chuck (17:00 8/31 update):



Also, an important Safety Tip: it is VITAL that folks DO NOT use our info for evacuation planning (this means you, Alan!). Our discussions here are with respect to a bunch of hardware, not feline or even human lives. We don't want to be wrong on either the high or low side, especially since being wrong on the high side has bad consequences for pricing, that's why I keep emphasizing this thing may not be as bad as the models are predicting because there are signs and portents the storm will not gain as much strength as forecast. If you are in an evacuation zone, get your pets, get your insurance paperwork, and GET OUT.

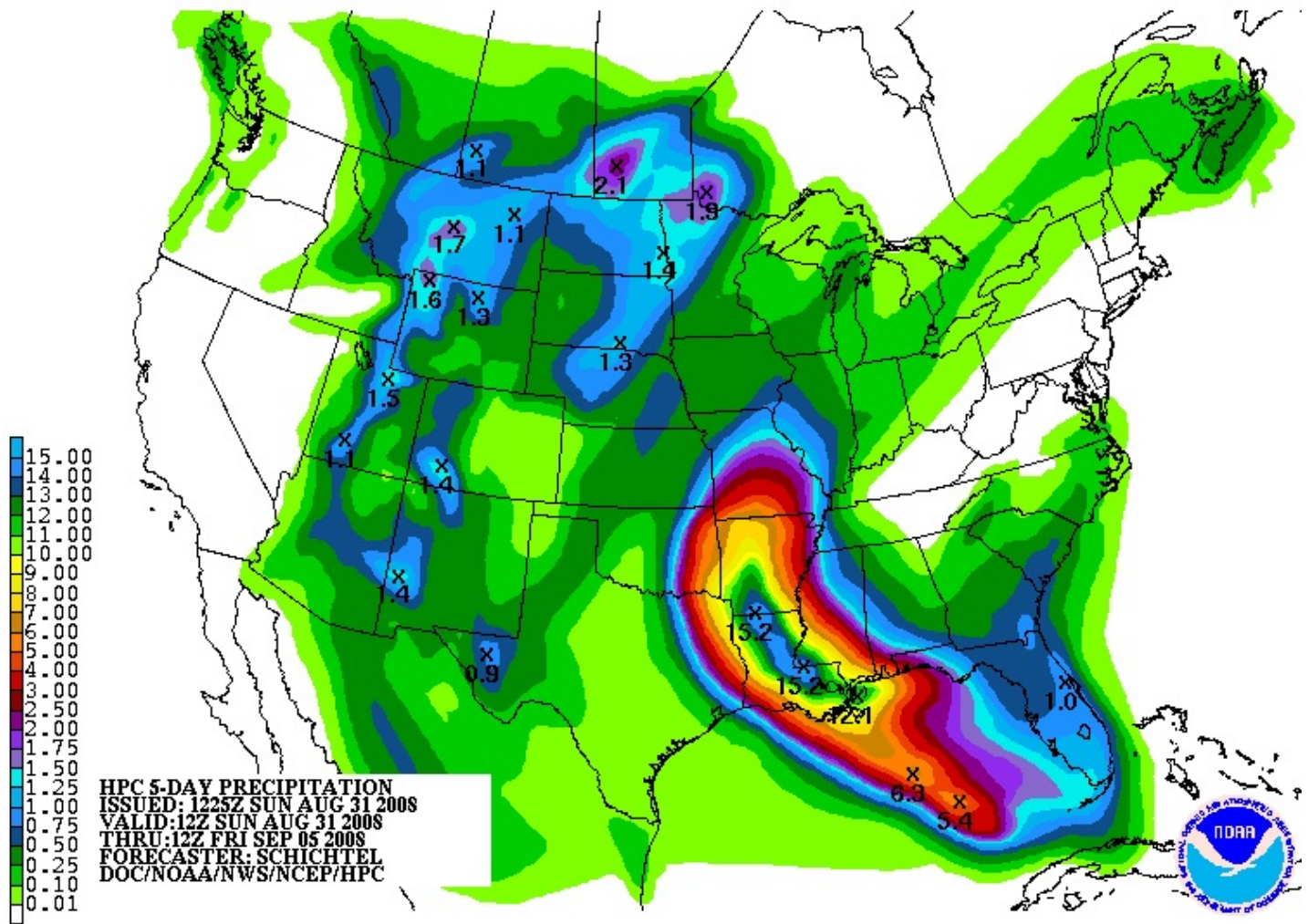
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A note on our modeling process: we take the official NHC track, the raw computer model tracks like GFDL, HWRF, LBAR, etc, and even run our own in-house fast cycle track/intensity models. These track and intensity estimates are feed to our main hurricane model (TAOS), which computes the wind, waves, storm surge, currents, etc. at each point in our database of over 50,000 elements in the GoM like rigs, platforms, pipelines, pumping stations, refineries, etc. We then have engineering

models for each type of infrastructure that calculates the damage and estimated down time for that element, as well as downstream impacts (eg if a pipeline is down, the upstream elements can't pump and the downstream elements don't get product).

Chuck has put together a dynamically updating page that will reflect the latest damage models/forecasts at this link: [KAC/UCF models](#). We will be updating this thread with damage estimate and breaking news as this story unfolds, as well as post another story on why Hurricane Gustav or any exogenous supply event is potentially critical in a world with little slack in supply of high quality oil.

HPC 5 day rainfall estimates (12z 8/31)



### PRODUCTION/INFRASTRUCTURE MAPS AND REFINERY INFORMATION

[Here's a link to a really good map of oil refining/SPR storage facilities in respect to the path of Katrina \(NB: OLD TRACK MAP!\)](#) and [here is a listing of production and refining capability for the state of LA.](#)



Just to give you a rough idea of where things are, the map above is a [probability swath for Katrina](#) (OLD TRACK MAP!) with the [Thunder Horse](#) platform as the red dot, and the other purple dot represents the [Mad Dog](#) development (100,000 bd); the [Holstein](#) development that produces at peak, around 100,000 bd of oil; and the [Atlantis field](#) that may have ramped up to around 200,000 bd in all. Put together these projects have the potential of around 650,000 bd, but as can be seen, they were sitting in an uncomfortable spot relative to the track of the Katrina. The white dot is where Port Fourchon is. This is where the [Louisiana Offshore Oil Port, or LOOP](#), is located. [Rigzone](#) pointed out that this is where the foreign tankers offload, [Google](#) and [Terraserve](#) maps you can see that the area is very low-lying. One of the big concerns is that there will be sub-sea landslides or other ground movement that might affect the LOOP. Were this to be disrupted, then foreign tankers would need to be diverted elsewhere, with the likely port being Houston.

[Here is a really good link/map \(from "Rod and Reel" no less\) of the LA southern coastline showing all of the Submersible and Floater Gulf rigs.](#)

We have accumulated resources from previous hurricanes below, but we'd like to find updated materials if you know of them. Recent refinery maps, recent rig maps in the gulf, recent gas fields, SPR facilities, the Intercoastal Canal, pipeline stations and transfer points, etc., etc. Leave links in the comments please.

Also, here's the EIA's [Alabama](#), [Louisiana](#), [Mississippi](#), and [Texas](#) Resources pages. They will also likely come in handy. Also, here's a [link to the national page](#).

[Here's another good resource for infrastructure maps and such. \(scroll down a bit\)](#)

[Here's a map from CNN with large and small refineries laid out.](#) (though it is an old storm track)

[Very detailed piece by RIGZONE on rigs and other infrastructure in the area.](#) (thanks mw)

[Here's a flash graphic of the oil refineries and rig maps from Hurricane Rita, it emphasizes Beaumont and Galveston's importance.](#) Click on oil production in the tab. Note the many rigs on the east side of the storm that will get the brunt of the damage from the NE quad of the storm...hence the high long-term GOMEX oil production damage estimates below.

[Here's a link to Rigzone's coverage of Gustav.](#)

You want a detailed map? Well [here's the probably the best MMS map I could find. Very detailed and lots of interesting stuff. \(VERY big .pdf warning\)](#)

Also, Scott Wilmoth at [Simmons & Co](#) was kind enough to send us this map. The map below captures only deepwater infrastructure. For a complete list of deepwater development systems (includes operator, depth, location): <http://www.gomr.mms.gov/homepg/offshore/deepwatr/dpstruct.html>

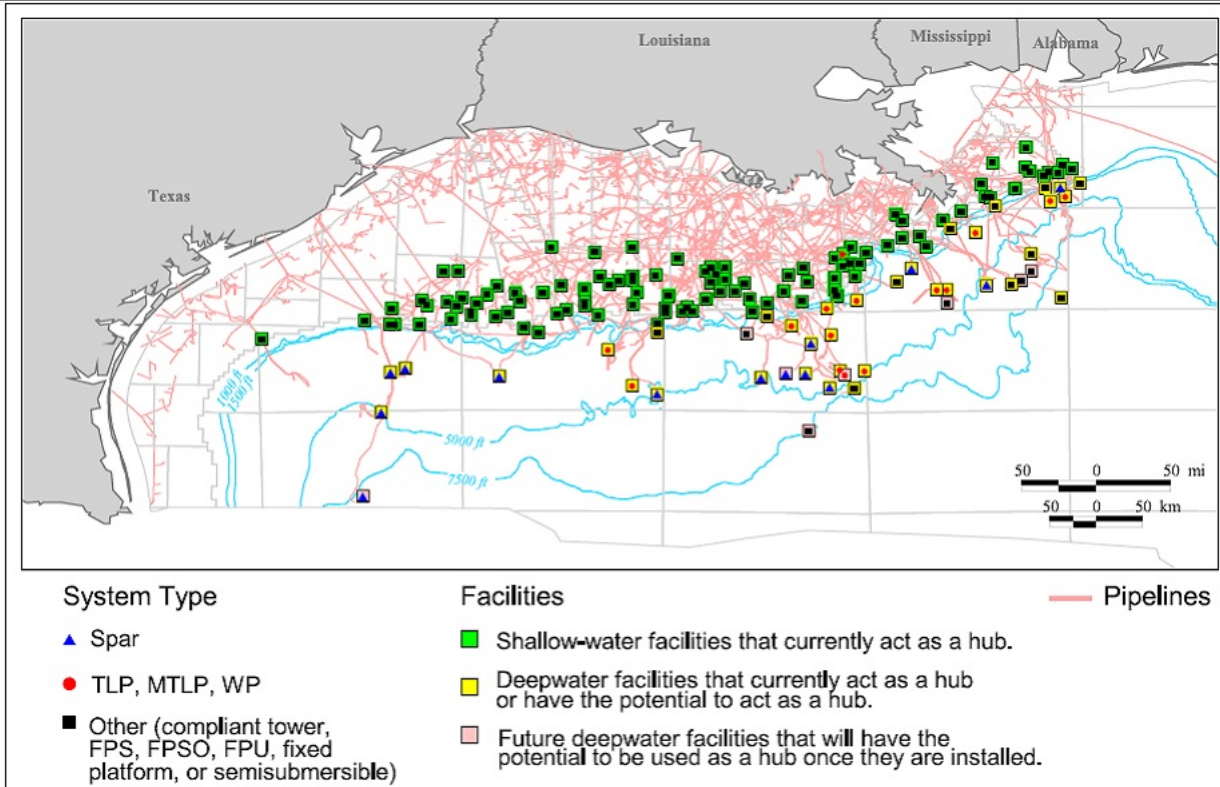


Figure 10. Current, potential, and future hub facilities.

*(Please deposit new relevant links, graphs, and comments in this new thread...we have updated the resources part of this post with new maps and some more old maps and articles from Katrina on the LOOP and Port Fourchon--important parts of the infrastructure, as we learned about three years ago. Please leave personal anecdotes and themes unrelated to hurricane for the other upcoming 'bigger picture' posts, as yesterdays information was difficult to upload for those on dial-up)*



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