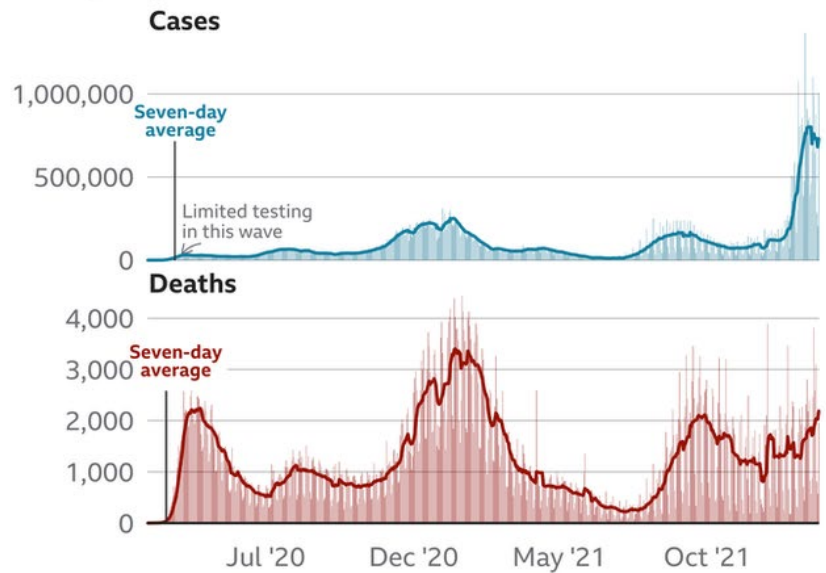


NPRE 477
NPRE 498ESU
NPRE 498ESG
Energy Storage Engineering
Spring 2022

Online Temporary Alternative Coverage and access during Covid-19 Pandemic and possible resurgence through mutations and variants

1. Please read the assigned-reading lecture-notes chapters.
2. Then answer the corresponding written assignment,
3. For questions about the assignments, please access the teaching assistants by email:
<https://www.mragheb.com/NPRE%20402%20ME%20405%20Nuclear%20Power%20Engineering/talist.htm>
4. Submit the corresponding written assignment through email to <https://canvas.illinois.edu>
5. Please use either the Word or pdf formats
6. In case of internet “rationing” (e. g. to health and government authorities), instability, or collapse through overload, please read the lecture notes and submit the corresponding assignments. Already-taken tests and submitted assignments would be used in assessing the final grade.

Daily reported cases and deaths in the US



Source: Johns Hopkins University

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Covid-19 has killed more people in 2021 than in 2020. The virus was reported as the underlying cause of death (or a contributing cause of death) for an estimated 377,883 people in 2020, accounting for 11.3% of deaths, according to the CDC. As of November 22, 2021, more than 770,000 people have died from the coronavirus, according to Johns Hopkins University data. Over 15,000 more people have died in 2021 than 2020 from Covid-19 in the USA.

Under high viral loads SARS-CoV-2 becomes a very heavy vitamin C scavenger causing depletion. The body requires a baseline of vitamin C just for the blood to remain adequately capable of binding oxygen and iron. A Cytokine storm elevates high serum ferritin levels resulting in unbinding iron and low oxygen level. Unlike animals who can

multiply the amount of vitamin C they produce many times over when sick, humans produce no vitamin C themselves and depend on diet and supplementation to restore levels.

Regrettably, some 3,278 colleges and universities across the USA have been impacted by the Covid-19 pandemic, with many temporarily closing their campuses and switching to online classes, affecting more than 22 million students.

To all and everyone we wish good health and well-being.

Number	Date Assigned	Due Date	Description														
1	1/19	1/26	<p>Reading Assignment  Preface</p> <p>Written Assignment Using a Ragone plot, compare the following energy storage options: 1. Chemical storage using Li ion batteries, 2. Fuel cells using hydrogen as an energy carrier.</p> <table border="1"> <thead> <tr> <th>Country</th> <th>Energy consumption [kWe.hr / (capita.year)]</th> </tr> </thead> <tbody> <tr> <td>USA</td> <td>12,878</td> </tr> <tr> <td>Japan</td> <td>7,432</td> </tr> <tr> <td>Switzerland</td> <td>7,206</td> </tr> <tr> <td>Germany</td> <td>6,027</td> </tr> <tr> <td>Hong Kong</td> <td>4,847</td> </tr> <tr> <td>China</td> <td>1,899</td> </tr> </tbody> </table> <p>Using the table, estimate the needed <i>rated power</i> for a solar or wind energy installation to provide the power needs for a family of four in different countries, assuming the presence of a capability to store the energy in battery banks, an overall conversion efficiency of 30 percent, and an intermittence (capacity) factor of 40 percent for both wind and solar.</p>	Country	Energy consumption [kWe.hr / (capita.year)]	USA	12,878	Japan	7,432	Switzerland	7,206	Germany	6,027	Hong Kong	4,847	China	1,899
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2	1/21	1/28	<p>Reading Assignment  Introduction</p> <p>Written Assignment An electrical storage battery is charged from a power supply at 1 kW for an hour. If its efficiency is 60 percent, how long would it take to totally discharge it if it used to supply a load at 100 Watts?</p> <p>List the advantages of energy storage in conjunction with renewable and conventional Energy systems.</p>														
3	1/24	1/31	<p>Reading Assignment  1. Energy Storage Options</p> <p>Written Assignment In the simple pendulum without friction, energy that is stored as potential energy at the top of its stroke ($E_p = mgh$) is transformed into kinetic energy at the bottom of the stroke ($E_k = \frac{1}{2} mv^2$), then back as potential energy in a cyclic manner. 1. For a stored potential energy of 1 joule what would be the speed v of a 1 kg pendulum at the bottom of its stroke? 2. To what height h will the pendulum rise at the highest point in its stroke?</p>														

4	1/26	2/2	<p>NEW Energy Storage Options</p> <p>Written Assignment</p> <p>Balance the chemical reactions used in the high temperature Iodine Sulfur (IS) hydrogen production process:</p> $2H_2SO_4 \rightarrow 2H_2O + ? + O_2$ $2I_2 + ? + 4H_2O \rightarrow 4HI + ?$ $4HI \rightarrow 2H_2 + ?$ <hr/> $2H_2O \rightarrow 2H_2 + ?$
5	1/28	2/4	
6	1/31	2/7	

Assignments Policy

Assignments will be turned in at the beginning of the class period, one week from the day they are assigned.

The first five minutes of the class period will be devoted for turning in, and returning graded assignments.

Late assignments will be assigned only a partial grade. Please try to submit them on time since once the assignments are graded and returned to the class, late assignments cannot be accepted any more.

If you are having difficulties with an assignment, you are encouraged to seek help from the teaching assistants (TAs) during their office hours. Questions may be emailed to TA's, but face-to-face interaction is more beneficial.

Although you are encouraged to consult with each other if you are having difficulties, you are kindly expected to submit work that shows your individual effort. Please do not submit a copy of another person's work as your own. Copies of other people's assignments are not conducive to learning, and are unacceptable.

For further information, please read the detailed assignments guidelines.